

September 2, 1965



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NOTES - 9/2/69 - BALCH

9/2/69

Following are revised data reflecting current known losses to MTF employees from Hurricane "Camille":

	NASA	OTHERS	TOTAL
Employee fatalities	0	4	4
Employee family fatalities	1	2	3
Employee injuries	0	4	4
Employee family injuries	2	1	3
Employees with total loss of housing and contents	13	137	150
Employees with extensive loss to housing and contents	11	261	272
Unaccounted for	0	0	0
Total personnel strength	78	2586	2664
(includes 335 GE subcontractor personnel and 121 temporary summer hires)			

Detailed assessment of damages to the facility and stage hardware is not complete, but tentative assessment for each is substantially the same as previously reported (NOTES - 8/25/68).

It is estimated that at least 90% of all MTF employees are available for work as of this morning, 9/2/69. ✓

Commercial power has been restored to the entire facility, and it appears that all systems will be operational in time to avoid constraint to static firings. ✓

NAR is targeting S-II-10 firing for 9/26/69, and Boeing is targeting S-IC-12 firing for 10/9/69. GE does not anticipate being able to support these at this time but is making every effort to do so. ✓

MTF continued during the past week to provide substantial support to the communities devastated by Hurricane "Camille", with a gradual phase-out toward the end of the week. We are now taking a close and comprehensive look at the situation, with the hope that we may be able to help in the long-range recovery planning. ✓

1. Mr. Foster 9/3/69
2. Dennis R. H.
3. Molly M.
B 3/8 Y. Nancy - jll

NOTES 9/2/69 BECKER

SPACE STATION - Brooksbank

Meeting with Frank Borman (8/27/69): As you know, Chuck Mathews has established a field directorate for the Space Station Phase B activities. Frank Borman is the director and is assisted by Frank Williams (MSFC) and Jack Small (MSC) and two secretaries. Eventually, Bill Hayes (LaRC) and an executive assistant (program control type) will be added. Colonel Borman's briefing to the study managers indicated that he intends to keep this staff very small. Primary function is to assist the centers in the execution of these studies. His office is supported by a Space Station review group which is composed of senior level technical personnel from throughout the Agency. We understand that Chuck Mathews has established this review group and proposed membership in a letter sent to you (August 21, 1969). MSC accepts this review group without question. When we read the charter of this group, we became somewhat concerned. ✓

Space Station Statement of Work Changes: Changes in the Statement of Work which were discussed with you, Dr. Lucas, and Dr. Rees on Tuesday afternoon were negotiated and agreed to by MSC, MSFC, Colonel Borman's office, and respective contractors. These changes were presented to Chuck Mathews on August 28 as a completely agreed-to package of data. Frank Williams took the lead and gave the results of the negotiations as an accomplished fact to Chuck Mathews. Chuck, however, insisted on a personal review of every word in the change package. This was accomplished and modification changes are being incorporated in both contracts. It is an unusual feeling to have to justify actions like these to two Headquarters groups, i.e., Borman and Mathews. We hope this is not an indication of the future. ✓

SPACE SHUTTLE - Mrazek

The configuration evaluation activity is continuing with support from almost all centers. We have MSC on board and participating. Based on the result of the Task Team evaluation, the Board will prepare the recommendation to the Management Council by September 4. The presentation to the Management Council will be on September 11. ✓

The math modeling and simulation work of different phases the Shuttle will experience are being started by establishment of a Simulation Task Team under CSE chairmanship and with participation of all concerned laboratories and offices. ✓

9/2/69

B_{9/2}WILSON STAFF STUDY REPORT ON APOLLO PROGRAM MANAGEMENT

The Apollo Program is termed an outstanding management achievement in a July report by the NASA Oversight Subcommittee. The report summarizes key concepts developed by NASA and contractor managements, and states that the Staff Study findings will serve as a logical starting point for further detailed inquiry necessary to determination of the applicability of these developments to other complex technological programs.

Among key concepts listed were the refined program control techniques used with incentive contracts, and a real time, flexible management reporting system which provided visibility to all program levels and permitted innovative effort by contractors while maintaining adequate discipline for program objective accomplishment. Another key concept was the use of systems oriented people in successfully defining and correlating the multiple program interfaces. But basic to Apollo's successful management was a clearly defined objective and the total dedication of the skilled people making up the balanced government/industry capability. ✓

NOTES 9-2-69 BROWN

3/9/8

9/6/72
F-1 Engine - Acceptance testing has been completed on the last deliverable F-1 engine under the present contract to support launches through AS-515. Engine activity at Edwards Air Force Base has now been reduced to one test stand operation for operations support and test of repaired and refurbished F-1 engines. ✓

Accelerating Learning in an Engine Development Cycle - Based on an initial feasibility study by some of our Engine Office people, it appears that by taking a hard look at our experience over the past decade, we should be able to refine the basic engine development process, thereby shortening the time and hopefully reducing the cost of bringing an engine system to maturity. Consequently, we are continuing this study and plan to further analyze the development patterns used during the past several years to ascertain those facets which have proven to be the most productive. Hopefully, we will be able to isolate ways to accelerate learning in an R&D cycle. To obtain maximum benefit from this effort, a steering committee composed of ASTN, Air Force Rocket Propulsion Laboratory, Rocketdyne, and Engine Office personnel has been established. (Lewis Research Center declined to participate.) The study is proceeding down three avenues: 1) interviews, 2) a limited literature survey and 3) an analytical examination of our development history. It is expected that the results of the study should be available in time to help formulate the basic development patterns to be used for the Space Shuttle main engine. ✓

NOTES 9/2/69 BELEW

9/3/2

B 9/8

PROJECTED OVERRUN OF CONTRACT NAS8-20899: A modification to contract NAS8-20899 with IBM for digital computers covering the projected overrun has been negotiated. The negotiated cost overrun was \$1,678,554, the maximum fee was reduced to \$59,000, and the minimum fee was changed to -\$100,000. If the allowable costs exceed the target costs, the target fee will be decreased by twenty per cent of the overrun up to the point where a negative fee of \$100,000 is reached. ✓

MDAC CONTRACT CONVERSION: Supplemental Agreement (conversion to dry) to the McDonnell Douglas Astronautics Company-Western Division (MDAC-WD), and signed contract have been executed. In accordance with Headquarters' hardware limitations, we are restricting MDAC activity on Solar Array System (SAS) and Thruster Attitude Control System (TACS) to preliminary design. ✓

SE&I CONTRACT ACTIVITIES: Meetings were held this week with MDAC and MMC on their proposed conversion of the SE&I contract to the Dry Workshop configuration. Major problems exist in trying to hold the Martin contract at its present value with the inclusion of MDA in the scope of work. This problem is being complicated by projected increase in MDA cost, which is a result in additional contractor furnished equipment versus drawings and complete structural skill being government furnished. ✓

AAP CSM PRR: MSC conducted the Dry Workshop CSM PRR at NAR on August 27 and 28. MSFC participated in the review. Approximately 75 Review Item Discrepancies (RID's) were written. Items of interest from the meeting are as follows:

Mr. Thompson groundruled to NAR to design the CSM systems for 50° inclination orbit, but planned the consumables and timelines for 35° inclination. It was not immediately obvious what the extra impact to the CSM systems is for this groundrule. We reminded MSC the OWS systems are being sized for the 35° inclination orbit. ✓

Generally speaking, it is the opinion of the MSFC attendees the PRR was well conducted; the CSM interface with the Cluster is defined; and the open areas that must be worked are documented. ✓

URGENT



Lee B.

That's
probably
why Bill
Purdy wants
to see me

urgently;
Any advice,
B

NOTES 9-2-69 DOWNEY

9/9/72

B2/8

1. PAYLOAD PLANNING: The Mission and Payload Planning Office is heavily involved in proposing and planning candidate experiments and payloads for DWS #2 and the Space Station mission. A complex situation has developed in the astronomy area in connection with planning for DWS #2. As you are aware, Dr. Mueller is pressing hard for the second ATM to be a stellar oriented mission. However, OSSA and the Astronomy Missions Board favor a second solar payload incorporating the Zirin telescope for ATM-B. We just received the MSF guidelines for preparation of POP-69-2C. These guidelines specify that the second ATM will accommodate a 72" stellar telescope for flight on DWS #2. It appears to us, based on presently available knowledge, that it will be difficult to develop a high precision, 72" stellar telescope for flight in January 1974. Furthermore, providing the capability to point a stellar telescope in any direction may prove to be a difficult requirement to achieve on DWS #2. However, we will submit funding requirements for the stellar telescope as indicated in the MSF guidelines.

2. EXPERIMENT MODULE STUDY: The effort to date has been concerned with Task I definition of the experiment program. A meeting was held at MSFC this week to review the contractor's (General Dynamics/Convair) work in defining the candidate experiments and payloads. We have been seeking wide participation in reviewing this work so that we will have support and endorsement of the candidate experiment program by all elements of NASA Headquarters. Representatives from OSSA, OART, OMSF, and MSC participated in the meeting in addition to wide involvement of persons from MSFC. The task of formulating the experiment program seems to be shaping up rather well now.

3. HIGH ENERGY COSMIC RAY EXPERIMENT: Dr. Don Hagge of MSC visited MSFC in connection with the Experiment Module Study. Dr. Hagge is the person at MSC responsible for Dr. Alvarez' proposed high energy cosmic ray experiment. You are aware, I believe, that Dr. Mueller is very enthusiastic about Dr. Alvarez' proposed experiment. We were originally considering Dr. Alvarez' experiment for the late 1970's (Space Station/Space Base); however, Dr. Hagge informs us that a simplified (and earlier) version of the experiment is being considered but has not yet been defined. Dr. Hagge suggested that it would be very beneficial if Dr. Alvarez or one of his associates could visit MSFC to discuss the experiment and to obtain information on our DWS #2 and Space Station planning efforts. We encouraged Dr. Hagge to initiate the arrangements for such a visit. This would be an appropriate follow-up to your recent correspondence with Dr. Alvarez.

J.D.
Please ask P.M. to prepare a well-coordinated letter for my sign. to GEM, appealing those guidelines. Without OSSA and the FMB's full support we won't get anywhere with that stellar 72" job. B

J.D.
Please arrange B

B9/2

9/9/2

1. THUNDERSTORM RESEARCH: Peak wind speeds of 60 knots (110 km/h) were recorded recently during a storm at NASA's 150 meter meteorological tower at the Cape in connection with analyses of winds which adversely affect vehicle operation. In this work, we are giving special attention to the outflow of extreme winds associated with thunderstorm. ✓

2. AS-506 FLIGHT ANOMALY: At 3.3 seconds after lift-off, the cross-range velocity exhibited a negative shift of 1.8 m/sec (the true error appears to be more like 1.2 m/sec), caused by Y-accelerometer output. At present, a firm explanation has not been given; however, it is suspected that the accelerometer had contacted an internal mechanical stop. More telemetry data from AS-507 will be awaited before attempting a fix. Due to the RTCC operational procedures, the Y-velocity shift was interpreted as an azimuth misalignment of the spacecraft. As a consequence, when a correction factor was applied for this fictitious error, the difference between the LVDC and IMU state vectors approached a no-go decision during earth parking orbit. ✓

3. CONFERENCE ATTENDANCE: Mr. Robert Ryan of our Dynamics and Control Division presented a paper on "Attitude Control of Manned Space Station" at the AIAA Guidance, Control and Flight Mechanics Conference, Princeton University, August 18 - 20. The presentation was well received. ✓

4. PERSONNEL TRANSFER: The eroding of our manpower substance due to personnel transfers to other MSFC organizations and attrition has reached a critical point where it becomes questionable whether we will continue to be able to support up-coming projects, such as the Space Station, effectively in those disciplines in which this laboratory once was strong. During the past months of this year, we have lost over 13% of our January 1, 1969, strength. This includes 6 transfers to PD in addition to the formerly co-located group of 17, 12 pending transfers to CSE, and 6 losses due to attrition and transfer to organizations other than PD and CSE. Thirteen percent may not seem much in the light of the overall MSFC situation, but at least in the case of AERO it is not the numbers which cause our hardships, but the skills we, as a laboratory, have lost. Now we have been assessed another 4 or 5 personnel losses, 2 to CSE and 2 to 3 to PD. A more detailed study of the serious impact of the personnel transfer situation is being documented and will be available for review. Generally, the need of CSE and PD for experienced individuals who obtained their skills in the laboratory, is certainly understood, but it is also felt that the laboratory should be allowed to re-staff its depleted ranks with new hirings of young blood. ✓

Horn/Kedner
Request
your
comment
about the
balance
of our
personnel
reassignment.
What, in
your view,
is optimum balance for Center as a whole,
in view of all our well-known restrictions?

B

SATURN:

NOTES 9/2/69 GODFREY

B_{9/8}

9/9/2

1. Elimination of Static Firing: Reference note 8/18/69, Godfrey, same subject. A meeting was held with Dr. Debus and other key MSFC KSC personnel on August 26 to discuss the MSFC rationale on elimination of static firing, 516 and subsequent. KSC was in general agreement with the MSFC position. Several action items were assigned in order for KSC to better understand the possible additional work they might encounter. We will keep your office posted if the action items lead to a possible problem. ✓

2. Saturn Stage Activity at MTF: Our ability to recover from the Hurricane Camille catastrophe is primarily dependent upon bringing the test crew up to a proficient operational level. We are providing assistance to MTF to permit continuous stage coverage, allowing MTF personnel the time necessary to recover and adjust to their losses. The contractors have also transferred in certain key personnel with static firing backgrounds from other locations such as KSC. NAR expects to be back to full strength this week and plans to be prepared to static test by the end of September. Boeing is targeting for S-IC-12 static firing in early October. Mr. Harry Johnstone has been designated to assess crew readiness to resume firings. We anticipate some delays in this area and may slip the firing dates to late October. GE expects to be in a position to support testing by the above dates. ✓ However, they are still not in a position to predict when they will be back up to the 100% capacity. ✓

3. S-IVB Stage Vibration Isolators: Recent checks on vibration isolators in the forward skirt and the aft skirt of S-IVB-507 stage revealed excessive debonds on approximately 15 items, and it has been decided to replace all similar type vibration isolators (approximately 70) on S-IVB-507 with a new type currently planned for installation on S-IVB-512 and subsequent. Inspections on S-IVB-508 through -511 will reveal whether or not similar action should be taken on these stages. The vibration isolator problem was considered solved and closed as late as one month ago. Evidently the problem is considered one of aging. Further design changes are being considered. ✓

LRV:

LRV Source Evaluation Board activity is progressing on schedule. The four proposals received indicate that desired performance/design parameters and delivery schedules are attainable. Our austerity message was apparently well understood. Each proposal reflected costs well within our budget restraints. A comparative analysis of the lunar surface model used in definitizing LRV requirements to the Apollo 11 landing site is in progress. Preliminary data should be available prior to the September MCM. ✓

NOTES 9-2-69 GOERNER

8F9/2

B 9/8

NOTHING OF SIGNIFICANCE TO REPORT

OFFICE OF DIRECTOR - MSFC

CODE	NAME	INIT.	<input type="checkbox"/> ACTION	<input type="checkbox"/> INFORMATION
DIR	Dr. von Braun			

REMARKS

Reference your comments to Dieter Grau's notes 9-2-69 re Pratt & Whitney's jet engine quality control effort.

You requested that a letter be prepared to Rocco Petrone giving the results of this effort.

After discussions with Hermann Weidner, Lee James and Jack Trott, we recommend that such a letter not be sent at this time. ✓

Qual Laboratory is looking at the jet engine practices of other manufacturers and airframe users such as G.E., Boeing, Lockheed, DAC, etc.

In 30 - 60 days at the conclusion of this broader look the letter will again be considered.

cc:

Lee James, PM-DIR

Hermann Weidner, S&E-DIR

Dieter Grau, S&E-QUAL-DIR

✓
B 9/29

CODE DIR	NAME J. N. Foster	DATE 9-29-69
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8K9/2

QUALITY PROGRAM REQUIREMENTS: Last week representatives of this Laboratory visited the Pratt and Whitney Aircraft Company in East Hartford, Connecticut, to observe and obtain information on the quality program employed in the manufacture of commercial jet engines.

Surprisingly, their findings revealed that by comparison with this industry our space hardware quality requirements are not nearly so demanding as many have professed. To illustrate the degree of coverage, some of the P&WA quality requirements are:

a. All parts and components (vendor procured or P&WA manufactured) are reinspected and functionally tested during receiving inspection.

b. All critical components are qualified and subjected to over-stress tests during qualification,

c. Each engine is hot fired and subjected to the performance requirements it will see.


d. After firing, the engine is disassembled to at least the component level.

e. The components then go through the same tests they did at acceptance.

f. The engine is reassembled, reinspected, and fired again.

Contractual requirements placed on P&WA by the aircraft manufacturers are the apparent basis for this extraordinary effort. Various penalties and service requirements fall back on P&WA when field failures occur.

Our requirements have never been this demanding. Now that we are entering the fixed price contract age (P&WA's contracts are fixed price) perhaps our quality approach will be affected even more than we anticipated. We will want to analyze these findings further, but, in the meantime, it bolsters our confidence to see that others recognize that to obtain quality hardware you must pay the price.



D.F.

Please prepare a letter to Rocco Patrone (new Apollo Program Dir) for my signature which gives the above facts. No appeal to reconsider any decisions, but just to remind him that other people are awfully careful about cutting corners when it comes to man-rated equipment. Ask Leebines to concur to text letter, please.

B 9/8

8/9/2

AAP: Cluster integrated test trade-off meeting was held at KSC on August 22. It was essentially a Test Panel Working Meeting even though the panel has not been formally established. The meeting attendance included the newly-assigned KSC Launch Operations Director, the LVO Director and many LVO participants and Spacecraft Operations participants, KSC AAP Program Office, MSFC (KSC resident office), MSFC AAP Program Office, S&E Products Office, S&E-QUAL, ASTN, CSE and MSC Program Office.

Specific actions coming out of the meeting are:

1. CSM Docking and Mate requirements (MSC)
2. CSM Crew involvement (MSC)
3. MDA/AM Altitude Chamber Test Requirements (MSC/MSFC)
4. KSC operational readiness additions to test flow (KSC)
5. KSC impacts of performing the cluster integrated test at KSC (KSC)
6. ACE involvement in integrated test (MSFC)
7. Experiment monitoring and servicing requirements in the stack (MSFC)
8. Identify the hardware constraints that limit testing in the stacked condition (MSFC)
9. Identify the simulator required for all testing activities (MSFC/KSC)

These items are being worked and will be the basis for follow-on meetings. ✓

B9/10

9F9/2

K.H.

Can we
cover on
this thing
for the
nuclear
booster in
2 manned
Mars flight?
Weight?
Power
requirements?
Does it
work in
zero-g?
How would
it fit in
nuc. booster?
B

1. HYDROGEN RELIQUEFIER: A program review of the Hydrogen Reliquefier Contract was recently held at the contractor's plant (Air Products & Chemical Corp). A complete prototype system has been designed and fabricated based on thermodynamic cycles developed at MSFC. The successful initial operation of this prototype hardware is a highlight of a program initiated in 1963. The studies have encompassed complete reliquefaction thermodynamic cycles for lunar and extended space operation as well as the current partial reliquefaction system for shorter space missions.

2. CLUSTER LIFE SUPPORT REVIEW: A presentation was given on August 25 to MSC medical personnel on the status of AAP cluster noise, lighting, and crew comfort. New clothing values were established to accommodate a recent reduction in the minimum Astronaut metabolic rate from 500 to 300 BTU/HR. The MSFC proposed minimum clothing value was accepted. The MSC medical personnel were satisfied with the status of cluster noise and lighting. Dr. Catterson, who is Dr. Berry's deputy, was the senior medical representative present. Due to the importance of the Environmental Control System thermal subpanel to medical considerations a doctor will be assigned as a permanent subpanel member. ✓

3. EFFECT OF FUEL CHEMISTRY ON ENGINE PERFORMANCE - F-1: As a result of the engine performance data on SAT-505, a test series is being run at Rocketdyne to assess various performance parameters. Among these variables considered are fuel chemistry variations. Preliminary results of these tests have indicated that other variables have a far more serious effect on performance than fuel chemistry variations. Based on this minimal potential gain, we are withdrawing our proposed RP-1 fuel chemistry research program. ✓

4. METALLURGICAL ANALYSIS OF AS-506 DEBRIS: Colonel Schulherr from NASA Headquarters and Mr. Rives of MSFC requested an analysis of material which had been recovered from the AS-506 S-1C stage during the flight of Apollo 11. Our analysis proved that the material was 2219 alloy, and from measurements made on the piece, it was further established that the piece was the top cap of an integrally milled stiffener from either the fuel or the lox tank. It was not possible to determine which tank the debris had come from. This piece of material is the only known debris recovered from AS-506. ✓

5. AAP HABITABILITY SUPPORT SYSTEM (HSS): During the HSS PDR held on August 26-29, orbital workshop heat input values for the HSS equipment, (which included a stove and refrigerator) were presented which, when combined with the orbital vehicle baseline heat loads, exceed the capability of the environmental control system (ECS) as defined in the Cluster Requirements Specification dated August 8, 1969. Changes to the present ECS will require level 1 CCB action. ✓

6. BIOASTRONAUTICS: The Bioastronautics group has begun to interface with Martin Co. as a necessary operating mode since Martin is in the role of "integrating specialist" here at MSFC for AAPO and also concurrently satisfies a "prime experiments" responsibility role for MSC AAPO. Consequently, we do expect increasing contact with both these sides of the Martin organization. ✓

NOTES 9-2-69 Heller

gr 9/2

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2/8

H-ALPHA SUPPORT FOR NRL ROCKET FLIGHT:

At the request of Dr. Tousey, this week we will support a rocket flight of an engineering model of one of his ATM X-UV spectrographs by making simultaneous H-alpha photographs at our solar observatory. This will be a flare flight with ESSA furnishing the flare-alert launch signal which we will receive directly through the ESSA network. Post-flight data analysis will correlate the X-UV data from the flight with our H-alpha data as well as H-alpha data from other solar observatories. ✓

NOTES 9-2-69 HOELZER

9/9/2

B 5/2

Negative Report.

NOTES 9/2/69 HUBER

9/2/69

Nothing of significance to report.

B 9/2

9/2/69 HUETER NOTES

8/9/2

B_{9/2}

No submission this week .

gK9/2

B9/2

OART Supporting Research Programs - Most of the OART Program Offices are reviewing status of the FY-69 programs and revising FY-70 plans. Mr. Lundin has completed a "top level" review of the FY-70 plans with several of his program directors and has recommended some revisions. The general direction in which these revisions appear headed is toward "nearer term" applicability of the research output -- with a very strong slant toward the Shuttle in those areas which are applicable.

From discussions with several program division personnel it appears that the only major impact on the MSFC plans will be to slow down the approval process in Headquarters and to reaffirm the element of indecision. At the present time it does not appear that any authority firmly anticipated in the Center will be lost and it is fairly definite that we will receive no funds which we had not already planned and asked for.

B.L.
What
do you
mean by that?

B

8/9/2

DEVELOPING INSTITUTIONS PROGRAM. We have been informed by the Office of University Affairs, NASA Headquarters, that Talladega College has been awarded a grant under the Developing Institutions Program. This means that a total of \$114,781 has been awarded to the predominantly Negro institutions in that phase of the program for which MSFC has cognizance. Originally the amount earmarked for MSFC was \$75K but was revised upward because of the significance of a number of the proposals. For the most part, the proposals concerned basic research. For your information, the grants are listed below:

Alabama A&M (Dr. George)	The Development of a Computer Code for Predicting the Neutron Reaction Cross Sections and Gamma Ray Spectrum in Certain Radiation Shielding Materials and also in Nitrogen and Oxygen	\$22,716
Oakwood College (Dr. Cooper)	The Synthesis of Ninhydrin Analogs for use in Identification of Amino Acids	\$24,829
Talladega College (Dr. George)	The Effect of Surface Conditions on the Work Function of Insulators and Semi-Conductors	\$18,985
Tuskegee Institute (Dr. Erdey)	Adapting an Amtran Terminal to Graphical Network Theory and to Develop Software for Adapting Amtran to the IBM 1620 Computer	\$23,750
Tuskegee Institute (Dr. Reames)	Research In the Growth of Insulating Magnetic Crystals Involving Second and Third Transition Metal Ions	\$24,501

\$ 114,781 ✓

B5/8

NOTES 9/2/69 MOORE

8F5/2

DRY WORKSHOP ATTITUDE CONTROL SYSTEM: Reference is made to my note of August 11, 1969, and to the action item you gave me during your visit to the Laboratory on August 26, 1969. S&E is prepared to recommend a dry workshop attitude control system configuration for PM approval. A meeting will be arranged during the week of September 2 - 5 for this purpose.

Since the dry workshop mission requires continuous attitude control by the CMG's during the manned and unmanned phases, two major changes to the wet workshop CMG attitude control system have to be incorporated. One of the changes is to make the ATM digital computer redundant. The digital computer is mission critical on the dry workshop mission since it is required to perform the automatic gravity gradient desaturation calculations and maneuvers during unmanned periods and is also in the stabilization loop during CSM docking. For the wet workshop, the CMG control system was designed only for the manned phase when astronauts were available to back up a computer or other system failure. Stabilization during CSM docking was accomplished by a separate workshop attitude control system. The second required major change is to incorporate a degree of automatic switching (rate gyros, sun sensors, etc.) during unmanned phases. Of course, this feature will also be available during manned phases. The redundant ATM digital computer configuration in our recommendation will facilitate the implementation of these requirements. ✓

With the above changes to the CMG control system, the next logical step was to consider the elimination of the CMG analog control computer and extend the use of the available digital computer. Eliminating the analog computers except for that portion which controls experiment pointing (Vernier gimbal) results in a slightly higher reliability prediction and decreases overall test and checkout requirements. ✓

Our decision to recommend this attitude control system configuration was made with the knowledge that proper elements of S&E and PM are evaluating additional requirements such as earth pointing and satellite communications experiments. The potential results of these studies were included in our evaluation and in the selection of the recommended system. ✓

In addition, S&E is proceeding with studies to determine the impact on the control and display panel and other subsystems which are necessary to satisfy the dry workshop requirements. ✓

NOTES 9-2-69 SIEBEL

9/9/2

B_{9/8}

1. Proposed Space Experiment - Maintenance and Repair

Central Systems Engineering called a meeting to establish a Working Group to define an experiment for OWS-2: "Maintenance and Repair on a Space Vehicle." The experiment will use the restraint, bonding tool, and mechanical tools being developed in this Laboratory. ✓

2. MDA Insulation

Astronautics Laboratory has investigated the MDA insulation system and has recommended a replacement of the polyurethane red foam spacer material to reduce the potential dusting problem. An agreement was made and approved to use a nylon net as a replacement spacer material. Due to this decision, we have removed the insulation from the MDA thermal vacuum test module and will begin reinsulating the tank almost immediately. ✓

NOTES 9/2/69 SPEER

9F9/2

B3/12

1. AS-507 TLI GO-NO GO Criteria: We are working with MSC on a further relaxation in the S-IVB/IU GO-NO GO criteria for TLI burn. Based on now having increased flight control confidence in safely handling an S-IVB cutoff at any point in the TLI burn, the new criteria would permit attempting TLI under any malfunction conditions unless there is a catastrophic risk or we can definitely say there is no significant chance of achieving TLI. With the reduction in instrumentation ship support there is no real time telemetry coverage of the restart pre-ignition sequence on the nominal azimuth for this mission, and therefore no way to detect most of our present NO GO conditions. We expect that the proposed new criteria would eliminate the present NO GO conditions identified in the mission rules. ✓

2. Review of Reductions in MSF Network Support: Rocco Petrone has scheduled a meeting at MSC on 9/4 to review the proposed reductions in the Manned Space Flight Network (MSFN) among the MSF Centers' Operations Managers. Since these proposed reductions represent a major step, Petrone/Phillips want a complete review prior to finalizing the arrangements with Office of Tracking and Data Acquisition (OTDA). We are informed by Headquarters that the Corpus Christi, Texas (TEX) will be deleted from the MSFN instead of Guaymas which is acceptable to MSFC. ✓

3. Apollo 11 Early Apollo Scientific Experiment Package (EASEP): We have learned from the MSC Experiments Systems Branch that the EASEP is essentially inoperable at the present time although intermittent short periods of data are received. The cause of the problem is unresolved but is reflected in an inability of the package to accept ground initiated commands. It was expected, and has proven necessary, to level the package periodically via ground command to compensate for drift. Since it is now impossible to correctly level the experiment, the data received is generally invalid. ✓

NOTES 9/2/69 STAMY

Bg/p

9F9/2

VISIT OF MIKE COLLINS TO NEW ORLEANS: Plans for the city of New Orleans to honor Astronaut Mike Collins tentatively include a visit to the Michoud Assembly Facility at 10:00 a.m., Saturday, September 6, 1969. Mr. Bryan Duff, Public Affairs Office for the Manned Spacecraft Center/Houston, is coordinating Collins' visit with city personnel. ✓

NOTES 9-2-69 Stuhlinger

B
9/8

No submission this week.

9F9/2

PROGRAM MANAGEMENT D/R

CODE	NAME	INIT.	<input type="checkbox"/> ACTION	<input type="checkbox"/> INFORMATION
	"J"			

REMARKS

Dr von Braun asked for my concurrence. I don't want to non-concur because I assume Graw's example - that POW disassemble after green run - is correct. However, I do not believe the implication, that POW's goal is more thorough than our is correct. See Godfrey's notes. Also the engine office tells me POW is not thorough.

I'm afraid if Petrone touches off a "logic hunt" on this, he will find such things as we pay more for, than anyone.

CODE	NAME	DATE
		4

Bill Cain - note from Bill Brown

1. Shouldn't be surprised

- would get engine practices for several years

- No. that they stop at various ^{Numbers} for different mfg.

Records show that Reliability of those which go through disassembly have lower reliability

- P & W has always ^{been} sloppy - we have always ~~been~~ had problems in this area

(O'ell ^(P&W) has better quality than ~~we~~)

This says we are inefficient since we spend a higher percent on Quality than P & W & Jet Engine activity

B_{9/12}

NOTES 9/8/69 BALCH

JF_{9/13}

Many MTF employees are still occupying temporary housing as a result of Hurricane "Camille", and much remains to be done to restore their normal living conditions, but very few are absent from work, and morale appears to be very good.

All major systems are back on line, and operations are normal or near normal in all areas. ✓

S-IC-12 - The stage contractor has revised the stage processing schedule due to the downtime caused by Hurricane "Camille" and the number of tasks yet to be completed prior to static firing. A propellant load test is now scheduled for 10/15/69 and 10/16/69, and static firing has been rescheduled from 10/9/69 to 10/22/69. ✓

S-II-9 - Stage is in the low bay of the Stage Checkout and Storage building. Previous plans called for shipment of this stage to Seal Beach later this month, but it is now expected to be stored at MTF until January 1970, and then shipped to KSC. ✓

S-II-10 - Static firing is scheduled for 9/26/69. Although this schedule could be impacted by problems that may arise as systems and facilities are brought back to normal operation, there are no definite constraints apparent at this time. ✓

S-II-11 - Stage departed Seal Beach on 9/3/69 and is expected to arrive at MTF on 9/16/69 or 9/17/69.

We are still taking an active part in the long-range recovery planning for the adjacent Gulf Coast communities ravaged by Hurricane "Camille." ✓

NOTES 9/8/69 BECKER

JKG/3

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SPACE SHUTTLE - Mrazek

The Space Shuttle Configuration Evaluation Board met at MSFC on September 4, 1969, and heard presentations by the evaluation task teams. The Board reduced the large number of configurations to three basic classes. Results of this evaluation will be presented to the Management Council Meeting next week. ✓

SPACE STATION - Brooksbank

The McDonnell Douglas Aircraft Corp. Phase B Definition Contract completed the approval cycle in Headquarters September 3. It was mailed to the Center and received in Mr. Davis' office about noon September 4. The contract was placed in the hands of the local McDonnell Douglas representative, and he officially acknowledged receipt. We have an implementation date of September 4. ✓

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ACE MAINTENANCE AND OPERATION: MSC has agreed to perform maintenance and operation of the MSFC ACE Station. The staffing of this station will be mainly with GE personnel.

COMPONENT DEVELOPMENT AND QUAL TESTING: Component development and qual testing continues at MDAC-ED. The voltage regulator and thermal capacitor development tests have been satisfactorily completed. Fixture leakage problems continue to delay the start of the tunnel extension qualification test. ✓

UNMANNED OPERATION OF ATM EXPERIMENTS: The ATM P.I.'s attended a meeting on September 3 to input their requirements for limited operation of ATM experiments in the unmanned portion of the Apollo Applications Mission. It was agreed that Marshall would review the requirements and decide which operating modes were reasonable and within the realm of accomplishment. Impact analysis of the selected modes would then be accomplished for presentation to the MSFEB. ✓

HABITABILITY SUPPORT SYSTEM (HSS): The Habitability Support System (HSS) Preliminary Design Review (PDR) Pre-Board Meeting has been rescheduled from September 23, 1969, to September 11 and 12, 1969, in order to provide early direction to MDA C-WD. ✓

9/9/69

B 2/12

OSSA POP 69-2 NEW START ADDENDUM - The addendum to the OSSA POP 69-2 containing estimated requirements for potential OSSA new start activities of interest to Marshall has been prepared. The new start data was submitted in three categories: Planetary Exploration, Bioscience, and Physics and Astronomy. The Planetary Exploration category is the Outer Planet Exploration Program as discussed with Don Hearth. The Bioscience submission contains two areas of interest: (1) A bioscience package for the Dry Workshop #2, and (2) A bioscience grouping to be flown with the Space Station. The Physics and Astronomy Program contains two orbital physics experiments and astronomy missions which are in accord with current OSSA and Planning Steering Group advanced planning. All workshop payloads have been assumed to be launched separately on experiment modules. Experiment module costs have not been included since the definition and development responsibility is that of MSF. Four flights for the High Energy Astronomy Observatory (HEAO) are costed with the HEAO "B" containing new experiments and planned as a reflight of the "A" mission spacecraft. The General Relativity Experiment is submitted as a new start in FY-72 (continuing SR&T activity in FY-71). This flight would be flown in conjunction with Dry Workshop #2. Total estimated requirements for these new start activities are shown below: ✓

	<u>FY-70</u>	<u>FY-71</u>	<u>FY-72</u>	<u>FY-73</u>	<u>FY-74</u>	<u>FY-75 & Runout</u>
New Start Submission	\$14.7	\$127.0	\$267.6	\$300.3	\$285.7	\$1,063.8

The transmittal letter states that if one or more of the recommended programs is approved, coordination will be required through MSF prior to implementation at this Center. ✓

NOTES 9-8-69 BROWN

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F-1 Engine - Investigation of the sequence line failure on R&D engine 111-3 at Edwards AFB discussed in the 8-25-69 notes indicates a faulty fillet weld as the main contributor to the failure. Five additional lines were welded the same day. The two lines applicable to production engines have been X-rayed at MTF and MAF and are satisfactory. ✓

Engine F-6066 which was contaminated on S-1C-10 and sent back to Canoga for cleaning and refurbishment is in the final stages of reassembly. Completion is expected the first of next week. ✓

J-2S Engine Procurement Plan - The procurement plan for J-2S qualification was approved by MSFC on 8-26-69 and transmitted to NASA Headquarters. Sid Cariski's office transmitted copies to reviewing offices on 9-3-69 and asked for comments by 9-10-69, which is the D&F approval date we requested. ✓

Our urgent need is for approval of authority to negotiate. Unless we have completed negotiations by 11-15-69 we will be forced into the position of terminating J-2S development in order to retain sufficient funding for the operational and flight support requirements of the J-2 engine for the Apollo program. ✓

JF 9/9

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2/12

1. EXPERIMENT MODULE CONCEPT STUDY: The experiment definition portion of the study (Task I) has been completed and the results reviewed by appropriate NASA elements, including OSSA and OART. Dr. Rod Johnson, the Headquarters manager of this effort, indicated that he was very pleased with the Task I results. The contractor (General Dynamics/Convair) is proceeding with Task II (identification of experiment module systems and operational requirements). The Experiment Module Study is under the general auspices of the Space Station Task Team to assure that appropriate interfaces are established between the Space Station and the Experiment Modules. ✓
2. HEAO PRESENTATION TO ASTRONOMY MISSIONS BOARD: The HEAO concept was presented to the Astronomy Missions Board on September 5 by Mr. Halpern of OSSA, Dr. McDonald of GSFC, and by Mr. Dailey of PD-MP. This presentation was essentially the same presentation which was made to Dr. Naugle and the OSSA Program Directors on August 21. I will provide additional details as soon as we obtain information on the AMB's reaction to the presentation. Dr. Naugle has not yet released the HEAO Announcement for Flight Opportunities to the scientific community. ✓
3. OSSA NEW STARTS: Dr. Naugle is holding a series of FY-71 "new start" meetings with his Program Directors. I understand that the objective of these meetings is to trim down the FY-71 new start effort being proposed by OSSA to match (within reasonable limits) expected FY-71 funding. It is obvious that OSSA has proposed many more development starts in FY-71 than the expected funding availability will accommodate. I believe, of the major programs in which MSFC is interested, the HEAO, the Outer Planets Program, and ATM-B have fairly good chances of surviving. (I assume that ATM-B will be funded by MSF under the AA Program rather than by OSSA.) ✓

NOTES 9/8/69 GEISSLER

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1. WEATHER SATELLITE TRACKING PROGRAM: The University of South Alabama has requested a copy of our weather satellite tracking program to use with their new tracking equipment. The university had been informed by Goddard SFC to contact MSFC to obtain the program for look angles for the tracking of weather satellites. Action has been taken by our Aerospace Environment Division to send this program and a description to the University of South Alabama. ✓
2. ESSA - WEATHER BUREAU SUPPORT BY MSFC: Dr. Cressman of the Weather Bureau has asked us through Mr. Robert Turner, MSFC Meteorological Coordinator, to use our MTF Weather Station in support of the ESSA Weather Network to temporarily replace the ESSA Upper Air Station at Bootsville, La., which - while being "hurricane-proof" -- was damaged during the hurricane by high water. We have agreed to assist ESSA until their Bootsville station is operational again. This assistance will be for approximately ten to twelve weeks. ✓
3. SLINGSHOT/LUNAR IMPACT WORK: A lunar targeting program has been developed for the UNIVAC 1108 and is presently in the checkout stage. The program is designed to target spent launch stages on circumlunar flights for disposal into heliocentric orbits or more specifically for lunar impact at a prescribed latitude and longitude on the lunar surface. Tentative plans here are for employing this program in targeting the S-IVB/IU for lunar impact on AS-507 and AS-508. On the former flight, Headquarters has not as yet requested lunar impact. ✓
4. S-II ULLAGE SYSTEM DELETION: At our request, NAR has run a simulation to investigate the effects of deleting the S-II ullage rockets, recently decided on for AS-509 and subs., on second plane separation. The results indicate no problem. ✓
5. AERODYNAMIC WORKBENCH LOW PRESSURE TESTS: The vacuum dump tank of the mothballed shock tunnel has been fitted with a pressure-tight access door, steel grating and bracketry in preparation for the low pressure test phase of the aerodynamic workbench, MSFC Experiment No. M507. Tests at ambient pressure with a modified unit (heavier motor) are in progress at present. This work is being carried out by our Aerophysics Division in support of the development and implementation of the AAP gravity substitute workbench experiment whose principal investigator is Mr. Randall of ME Laboratory. ✓
6. EDUCATIONAL ACCOMPLISHMENT: The Master of Science degree in Mathematics was awarded to Mr. John E. Moore of our Mission Planning and Analysis Division by Vanderbilt University on August 23. The degree was obtained through the MSFC Graduate Full-Time Studies Program. ✓
7. SEMINAR PARTICIPATION: Two employees of the Astrodynamics and Guidance Theory Division participated in the Technical Seminar on Guidance and Control sponsored by Optimal Data Corporation and held in Huntsville on August 25 and 26. Mr. Hugo Ingram presented "Numerical Problems Associated with Optimization Theory," and Mr. Wayne Deaton filled in for a last-minute cancellation by Dr. Battin of MIT with "Saturn Guidance as Applied to Rendezvous Mission." ✓

OK

SATURN

GODFREY

9/9/69

B 9/12

1. Quality Program Requirements: Mr. Grau pointed out in his notes of September 2, 1969 that our Quality Program requirements are not as demanding as those imposed on Pratt and Whitney by aircraft manufacturers buying jet engines. The note also implied that we at MSFC may not be paying enough for Quality. In all probability we are paying considerably more for Quality requirements than the aircraft manufacturers pay in jet engine procurement. The problem is in how we buy our Quality requirements. The NPC series NASA Quality documents require extensive documentation and prior Government approval of all the contractors' plans. This forces the contractor to anticipate what the Government may want, and price Quality high to be safe. The type of testing which Mr. Grau mentioned in his notes is usually declared as a requirement in our contracts and negotiated well after the contract is awarded, where we must pay heavily and argue for each test. In future contracts, such as the Shuttle, the basic test requirements should be identified at the beginning of the program, and priced in at that time. ✓

Dietrich
Grau

for comment

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2. Saturn V Breadboard Operations: Currently the Saturn V Breadboard is operating on two shifts per day. Effective October 1, 1969, the operation will be reduced to a single shift per day.

LRV ✓

1. The TRW presentation on LUNAGEM last week applied an earth-proven technique to lunar surface mobility. However, there was no mention of potential development problems based on the practical restraints we face today on LRV. While I believe the concept is valid and should be investigated for future application, early application as proposed by TRW appears out of the question. ✓

R.G.

What
specific
action do
you
recommend?

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a. The very valid proposal to use LM residuals must be tempered with our current LM ΔV concerns. Also, we are prevented today from using excess LM electrical power for LRV recharge, much less propellants.

b. The deployment scheme requires excessive astronaut time based on present MSC restraints. They will not allow even a manually deployed LRV solar cell. ✓

c. The current restriction on maintaining line-of-sight LM distances does not permit utilization of large traverse distances quoted for LUNAGEM. ✓

d. Our present knowledge of lunar terrain tells us a significant amount of maneuvering would be required. LUNAGEM performance penalties drastically limit maneuvering or science stops. ✓

e. The developmental test problems alone appear difficult. Hard vacuum testing of a very low plenum chamber propulsive device in 1/6 G will probably be very expensive. ✓

R.G.

After every successful LM landing there is bound to be some fuel left in the tanks of the DPS. We're not talking about cutting into the available for the descent itself.

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NOTES 9-8-69 GOERNER

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NOTHING OF SIGNIFICANCE TO REPORT

NOTES 9-8-69 GRAU

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No submission this week.

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AAP Attitude Control Requirements: A meeting was held at Houston with the MSC AAP Office to discuss the Attitude Control Requirement and Experiment Pointing within the capability of the Dry Workshop Attitude Control System (discussed in the September 2 Astrionics Weekly NOTE).

a. The CSM has the capability to provide an earth pointing mode with the Z axis of the workshop pointing down along local vertical (Z/LV mode). CSM/RCS plume impingement may preclude using the CSM for this mode, and the problem is being studied.

b. The Dry Workshop Attitude Control System (SVWS) does not include a design requirement to provide an earth pointing (Z/LV) mode; however, if this capability exists, the Z/LV mode would be used for both the earth resources experiment and during CSM rendezvous.

c. The impact of not providing the Z/LV mode for rendezvous is:

- (1) Terminal Phase Finalization (TPF) is critical because of VHF ranging during braking
- (2) Must rely on ground station solution at Terminal Phase Initialization (TPI) which is not as good as onboard solutions
- (3) The impulse usage at TPI is greater; however, this is a small impact.

d. It appears there will be some capability to provide a Z/LV mode with the Thruster Attitude Control System (TACS) for earth resources. At present, the studies indicate that the SVWS has the capability to acquire and hold in the XIOP-Z/LV mode for at least one orbit with TACS controlling to approximately $\pm 2^\circ$ if minor modifications are made to the Pointing Control System (PCS). Expanding the size of the cold gas TACS to provide impulse for this XIOP-Z/LV capability is being investigated and the outlook is favorable. A firm S&E position is required on the SVWS capability for this mode prior to the baseline meeting on September 17 and 18. ✓

1. LUNAR ROVING VEHICLE (LRV): Thermal analyses of the LRV are in progress. Preliminary results indicate that the LRV temperatures during translunar coast can be adequately controlled by passive means, (i.e., painted surfaces). After deployment on the moon, the traction drive system could encounter temperatures lower than -40°F in shadows during the Lunar Day. The extent of the temperature excursion is a function of time in the shadow. Results of a study on extending the emergency operating life time of the Portable Life Support System (PLSS) for LRV concluded that the present 30 minutes emergency operating mode of the PLSS could be extended through use of additional O₂ bottles connected to the back pack by flexible lines. In addition, the studies indicated that an astronaut would be adequately cooled by this O₂ flow for times in the order of 1-1/2 hours with metabolic rates experienced on Apollo 11. ✓

2. IBM PARTICIPATION IN SATURN V WORKSHOP STUDY EFFORT:

IBM does not presently have contractual authorization for any effort to support AAP orientated missions. The Analytical Mechanics Division prepared a work statement for PM-IU consideration several weeks ago. Their initial response was negative. The concern on our part is that interrelationship of honeycomb structure, local equipment loads, and vehicle body loads will require considerable evaluation which can be performed better by IBM than by a new contractor. ✓

3. SUMMER FACULTY PROGRAM: Dr. Simpson, from Talladega College, has completed his summer assignment with our Materials Division. We were well pleased with his work and he indicated that he may submit a proposal to us for work that can be done at Talladega College under the "emerging institution" that is managed at MSFC by Mr. Kent. ✓

4. PERSONNEL: Within the past several weeks, 3 mechanical technicians from our Test Division suffered heart attacks and are still in the hospital (King - age 43; Rooks - age 44; Gatlin - age 34). Naturally our main concern is for rapid and complete recoveries for the men, but this also led us to make a cursory review of our technician work force status. The results indicate that of the 189 man technician work force, 44 have some physical limitation, (e.g. heart conditions 13, etc.). ✓

5. ORGANIZATIONAL MOVES: We will begin this weekend with the move which will locate Central Systems Engineering in building 4610 and our Propulsion and Thermodynamics Division in building 4666. ✓

See Bdeur

for comment.

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1. LUNAR EXPERIMENTS: Dr. Marcus Langseth, Principal Investigator on the ALSEP Lunar Heat Flow Experiment (Apollo 13), has asked if Jim Fountain of this laboratory would make conductivity measurements on some glass beads for him. The measurements would be used as a cross-check on the A. D. Little calibration of the heat flow probe. We are confident that we can do them and do a good job, so we agreed to the program. Dr. Langseth also mentioned the possibility of measurements on the Apollo 11 core sample. However, he seemed to think there would not be enough material for us to use (we need about 100 gms). A more likely possibility for the near future will be to make measurements on a simulated sample prepared by Langseth based on the constituency of the core sample. We think the relationship with Dr. Langseth will be interesting and fruitful, and he will be helpful in our getting some lunar samples. ✓

2. SOLID STATE PHYSICS: Our Solid State Physics Lab was visited this past week by Dr. A. Scharmann, head of the Physics Department of the University of Giessen, Giessen, Germany. Dr. Scharmann has done considerable research on luminescence and other properties of ZnS. We discussed with him our basic solid state program investigation of ZnO. Dr. Scharmann expressed great interest in this program. He is also interested in making some measurements, such as thermoluminescence and thermal stimulated conductivity on single crystals of ZnO. We gave him some crystal and powder samples to take back with him for this purpose. We will communicate with each other regarding the results of our experiments and then intend to produce a joint publication in the open literature. The close relationship with Dr. Scharmann proves to be quite fruitful. Two of our NAS postdoctoral research associates, Wegner and Rehmann, obtained their Ph.D.'s under Professor Scharmann. ✓

3. APOLLO 11 SOIL MECHANICS DATA: Dr. Costes, in his capacity as Team Leader of the Apollo 11 Soil Mechanics Investigation Team, has submitted the 45-day mission report and inputs for the first article on scientific results from the mission to be published in the Science magazine. ✓

NOTES 09-08-69 HOELZER

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Negative Report.

NOTES 9/8/69 HUBER

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1. OUTER PLANET EXPLORATION (OPE): We contacted Mr. Bob Kraemer, OSSA Planetary Programs, on September 4, 1969, concerning the status of their evaluation of the OPE implementation plans submitted by MSFC, JPL and GSFC. Mr. Kraemer reported: (1) Dr. Naugle was very impressed with the MSFC presentation given to him here August 21, 1969; (2) Dr. Naugle has specifically said he thinks MSFC's funding and manpower estimates are more realistic than JPL or GSFC estimates; (3) Dr. Naugle wants to do more business with MSFC; and, (4) Dr. Naugle's main concern is the fact that MSFC is an MSF Center, and he would need assurance that manned projects would not interfere with MSFC manpower committed to the Outer Planets job. Mr. Hearsh, Mr. Kraemer, et. al, will meet with Dr. Naugle September 6, to formulate a recommendation to Dr. Paine. Mr. Kraemer said he thought Dr. Naugle would personally decide upon the recommendation, and that MSFC's current chances for the assignment seem excellent, as far as Dr. Naugle is concerned. Mr. Kraemer said he would continue to keep us informed, so far as circumstances allow. ✓

2. NUCLEAR ENGINE TEST: The nuclear XE engine was tested for the last time on August 28, 1969, at the Nuclear Rocket Development Station, Jackass Flats, Nevada. The test consisted of two startups to intermediate Power (~600 MW). The high specific impulse ramp mode was utilized in both starts to bring the chamber temperature to 4090°R. The intermediate power holds for the two runs were 3 minutes for the first, and 4 minutes for the second. Testing was terminated by the exhaustion of the helium supply used in the altitude simulation equipment. The XE engine will now be removed from the test stand, since an underground nuclear test is scheduled at the AEC proving grounds in the near future. ✓

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9/8/69 HUETER NOTES

9/9/9

B 9/12

No submission.

NOTES 9/8/69 JOHNSON

9/8/69

B 9/12

OART Funds Withdrawal - OART has initiated action to withdraw about \$185,000 of FY-68 authority. The funds affected are in the Propulsion Engineering Activity account and had been earmarked for propellant buys. The residual developed because of late decisions (May-June-July 1968 time frame) by Headquarters on the precise levels of effort and content of work to be accomplished in continuing the Aerospike Engine research -- low cost Solids - SIVB vehicle research being considered competitively at that time. ✓

Funding for the required propellents will have to be covered by the FY-70 authority. This will result in some reduction of the planned research effort in support of the Shuttle. ✓

NERVA Engine Control System Meeting - SNPO - Cleveland is initiating the effort to design the control system for the NERVA Engine. Personnel from SNPO - Washington and Cleveland - met with MSFC personnel on September 4th to investigate the possibility of obtaining control functions from a standard (or advanced) IU rather than developing independent, stand-alone control systems. MSFC personnel agreed to have the possibility of accommodating the stated requirements in the IU investigated and to provide data to SNPO-C for comparative cost analysis. IBM is currently engaged in a study contract for the Center. This new effort will be made a part of that work. ✓

NOTES 9/8/69 MOHLERE

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Nothing of significance.

NOTES 9/8/69 MOORE

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9/2/69
DEFINITION OF AAP INSTRUMENTATION AND COMMUNICATION SYSTEM:

Astrionics Laboratory has arrived at a position on the changes necessary to implement the dry workshop instrumentation and communication system requirements. Briefly these changes are:

ATM - Modification of the simplex RF command system to a redundant command system.

* Addition of television system hardware to route both OWS/AM/MDA and ATM coverage to the CSM downlink.

OWS/AM/MDA - Replace present (Gemini) OWS/AM/MDA telemetry system with equipment designed for the 10 month mission requirement of the Saturn V dry workshop. Portions of this system are considered mission critical requiring state-of-the-art circuits that satisfy the dry workshop single point failure requirements. ✓

These proposed changes are currently being discussed with CSE and PM. ✓

NOTES 9-8-69 SIEBEL

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1. Biological Contamination Test of Lower Body Negative Pressure Device:

At the request of the Mechanical and Crew Systems Integration Division, ASTN, we conducted tests on the Lower Body Negative Pressure Device (LBNPD) to determine the level of contamination occurring when it is used in a test. Test samples were taken before the test, immediately after, and 72 hours later. In each successive test there was an increased amount of contamination. From these preliminary tests, it has been recommended that more accurate tests be done to determine the extent of the problem of bacterial growth and that a procedure for a biocidal wipe be developed to decontaminate the Chamber after each use. ✓

2. Biomedical Experiment: An urgent request for machining a diaphragm mold has been received from ASTN. Rubber diaphragms will be molded here and flown to Houston for use with the inflight metabolic analyzer. This is part of the biomedical experiments. ✓

3. Space Maintenance/Repair Tool Display: At the request of NASA Headquarters through PA at MSFC, a pictorial and descriptive compilation is being made of several tools and processes developed by ME Laboratory for use in maintenance and repair of structures and systems in space. They include Flyball Tool, Spin Torque Tool, Bolt Removal Tool, Open End Ratchet Wrench, Restraint, Electrostatic Grippers, Stud Bonding, Drill with Chip Collector, Cutter and Winchester Western. This information will be furnished next week to NASA Headquarters for their consideration as display material at the 1970 World's Fair in Osaka, Japan. ✓

4. Magnetic Hammer: At present there are four requests pending from Technology Utilization for magnetic hammer systems. These will be honored when the contracts are processed and hammer systems are available. One recently returned system is being reconditioned and updated to the latest design. ✓

NOTES 9/8/69 SPEER

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7/12/13
1. Network Reduction Meeting: Gen. Phillips and Rocco Petrone co-chaired this meeting at MSC on 9/4 and decided to accept all proposed network reductions for future Apollo flights. Elimination of Antigua has the immediate consequence of reducing the southern launch azimuth limit from 108° to 96° . (The remaining launch window varies typically between 1.7 and 3.3 hours, depending on mission, month and day.) Gen. Phillips expressed some concern that these reductions may go too far and established a new requirement for three 210' antennas (only Goldstone exists now). He would also prefer retaining at least one more ship (Redstone) to building a new site at Santiago for AAP. Additional items of interest: MSC has found it very difficult to develop trajectories for all the new lunar science landing sites. MSC also requests a lunar communication satellite system to maintain voice contact on the far side. ✓

2. AS-506 Y-Velocity Shift: Reference Notes 9/2/69 Geissler (copy attached). In spite of the observed step function in the Y-velocity component of the Launch Vehicle Digital Computer (LVDC), the Guidance Officer in the Control Center made the correct decision based on adequate information available to him. He was performing routinely at least five separate guidance comparisons, four of which were well below the NO GO limit in crossrange velocity and only one of which was approximately at limit. This particular comparison of the L/V and S/C guidance computers employs a compensation for an assumed azimuth error of the CM guidance computer. The step function which occurred at about 3 sec. made this assumption incorrect. The Guidance Officer knew this and disregarded this particular comparison. His recommendation at all times was "go" for second burn. ✓

3. Space Shuttle Configuration Evaluation: This office participated in the Space Shuttle Configuration Evaluation and provided the MSFC co-chairman for Operations, Safety and Refurbishment. Bob Moser, KSC, is chairman. The efforts of the task group covered a period of approximately three weeks and, even though in many cases sufficient data was not available to totally evaluate the classes of configurations, a configuration relatively best suited for operations was selected. However, it is anticipated that the Phase B Study Effort will be required to finalize the ranking process. ✓

1 Attachment

as stated (Dr. von Braun and Mr. James' copy only)

NOTES 9/8/69 STAMY

9/9/69

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9/12

"Outside Work" by The Boeing Company at Michoud

Tentative approval was given to The Boeing Company to use the MAF facilities to provide superstructure assemblies to the Litton Company who are bidding on a Navy contract for the DD 963 class ship. Data presented by Boeing indicates that the size of this contract may be far greater than previously anticipated. The Boeing Company has been requested to provide additional detail regarding the proposed plant layout, including details as to the time phasing of the installation of additional facilities as well as the decision points at which NASA would be required to approve further utilization of the plant. This data will be presented to MSFC personnel after receipt. At that time, we will determine if full approval can be granted. ✓

NOTES 9-8-69 Stuhlinger

B 9/12

9/12

ASTRONOMY MISSIONS BOARD MEETING: At the Astronomy Missions Board Meeting on September 5, Dr. George Mueller gave a presentation on the Integrated Plan. There was no time for a discussion between Dr. Mueller and the Board; however, a lively discussion ensued after Dr. Mueller had left. A report on this discussion will be submitted as soon as necessary background information is available. ✓

To Bad!
B

Sept. 15, 1969





NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA 35812

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NOTES

IN REPLY REFER TO: PM-DIR

October 2, 1969

TO : Dr. von Braun, DIR

FROM : Director, Program Management, PM-DIR

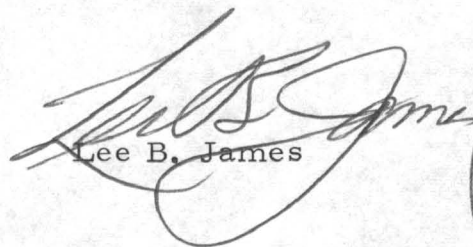
SUBJECT : S-II Air Force Quality Support

Reference is made to subject item in Mr. Grau's Weekly Notes of September 15, 1969, and your question about bringing Sam Phillips into the matter (copy attached).

Personnel in my office have looked into this with our Saturn people, Dieter Grau and his people, and with John Condon, who is handling the matter at Headquarters. From this look it appears that the problem may go away at the Headquarters' level, or if it doesn't, that we can resolve it without adversely affecting the follow-on program. I, therefore, do not think it necessary to get Sam into this, at least not at this time.

The Air Force did ask NASA Headquarters to pick up the fifty Air Force spaces and people "loaned" Headquarters in 1964 to help WOO's NASA-O cover S-II and CSM (nineteen of these are now on S-II). Headquarters countered with the proposal that these be gradually phased back to the Air Force, but the Air Force has not yet accepted this.

John Condon advises that this whole matter is in the preliminary negotiation phase and no final course has been agreed upon. He also advises that he will consult with us as negotiations progress and prior to any final decision. We believe we can work out an acceptable phasedown schedule should this course be decided upon.


Lee B. James

cc:

S&E-QUAL-DIR, Mr. Grau
PM-SAT-MGR, Mr. Godfrey
PM-DIR, Mr. Dyer



NOTES - 9/15/69 - BALCH

B 1/20

S-IC-12 - Current stage processing schedule calls for static firing on 10/22/69, with propellant load test on 10/15/69 and 10/16/69. ✓

S-II-9 - Stage was installed in the vertical position in the Stage Checkout and Storage Building on 9/12/69, and controlled atmosphere cocoon has been installed. Present plans call for shipment to KSC on 1/8/70. ✓

S-II-10 - Stage contractor has rescheduled static firing from 9/26/69 to 9/24/69. There is some doubt that this schedule can be supported, but no definite constraint has been identified. ✓

S-II-11 - Stage is now expected to arrive at MTF from Seal Beach on 9/17/69. ✓

GE Service Contract - In accordance with directions issued by NASA contract representatives on 9/5/69, General Electric has submitted a proposal for the continuation of General Support Services at MTF during the period 10/1/69 through 12/31/69. The proposal amount for this three-month extension of the present contract is \$5,758,000.00, which includes \$93,000.00 Base Fee and \$416,000.00 Award Fee. It is anticipated that the NASA position will be developed by 9/17/69, and negotiations are expected to commence shortly thereafter. ✓

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9/15

9/15

SPACE STATION: At the McDonnell Douglas Corporation briefing last week, results of the MSFC inhouse Space Station activity was presented by Bob Marshall. The acceptance of the particular presentation by the representatives of NASA Headquarters, the other field centers, and the contractors was exceptional. The quality of both the material and presentation was highly praised by the audience, and several of these groups including Headquarters and KSC have requested that an expanded presentation be given to them by Mr. Marshall. For example, Bob Hock (KSC) would use this presentation to activate and mobilize KSC support to the Space Station activity.

Bob Marshall

Congrats

B

SPACE SHUTTLE: The Configuration Evaluation Board presented its findings to Dr. Mueller and the Management Council on 9-10-69 and 9-11-69. Dr. Mueller redirected the study effort in several areas and established several action items. The most important change was his desire for a Space Shuttle with a take-off weight of 3 to 3.5 M pounds.

H.B.

I've never understood what's so magic about 3 or 3.5 M pounds

B

A meeting was held with General Dynamics/Convair on 9-12-69 to redirect their study effort based on the requirements established by Dr. Mueller. A similar meeting is scheduled with Lockheed on 9-15-69

LUNAR EXPLORATION HARDWARE FUNDING: An integrated lunar exploration hardware development schedule is being developed in conjunction with Lee Scherer's office. The schedule includes some possible new starts of small items of lunar exploration equipment, such as a small automated rover, lunar flying unit prototype, a roving vehicle science package, and a moderate depth lunar drill which can be landed on a slightly modified Lunar Module. Approximate run-out funding is \$200M with FY 70 requirement of \$5.7M.

B 2/20

EVA FILM RETRIEVAL TRADE STUDIES: A meeting was held on Tuesday, September 9, 1969, to review the status of the ATM EVA retrieval studies. A one-G mockup was assembled in Building 4619 to demonstrate the relative positions of the AM EVA hatch and the ATM workstations, and the line of sight between these workstations. Visual examination of the one-G mockup indicates that the AM thrust structure interferes with the clear path between the AM and ATM. It is also apparent that rotation of the AM or ATM would solve the clear path problem. A clear path is highly desirable for accomplishing EVA. ✓

Last week, MDAC completed a study of the hardware, cost, and schedule impact for rotating the AM. A study will be conducted starting today, 9/15/69, between MDAC and the MSFC ASTN laboratory to determine the optimum method for achieving a clear path between the EVA workstations. A minimum cost and schedule impact is the objective. ✓

HABITABILITY SUPPORT SYSTEM (HSS): The Habitability Support System (HSS) Pre-Board Meeting was held at MSFC on September 11, 1969, with representatives in attendance from MSC, KSC, MSFC, MSF, and McDonnell Douglas Astronautics Company. The HSS Board Meeting is scheduled for September 30, 1969. ✓

FAILURE MODE EFFECT ANALYSIS (FMEA): A Failure Mode Effect Analysis (FMEA) conference has been scheduled at MDAC-WD on September 25 and 26, 1969, with representatives of various MSFC organizations and Martin Marietta attending. The general purpose of the meeting is to establish the status of the activities associated with accomplishing the FMEA's. The MDAC-WD will be asked to discuss the groundrules to be used in accomplishing FMEA's, and the timeframe we can expect accomplishment. The deficiencies found in the preliminary FMEA's submitted for the HSS PDR will also be discussed. ✓

UNMANNED OPERATION OF ATM EXPERIMENTS: In compliance with the action item assigned at the P.I. meeting held on September 2, we have selected five modes for potential unmanned operation of the ATM experiments: (a) fixed offset pointing with TM data only, (b) fixed offset pointing with TM and video, (c) selective pointing with TM and photographic data, (d) selective pointing with TM and video, and (e) selective pointing with TM, video, and photographic data. ✓

9/15/69

3/20

BOB VISIT - Two representatives from BOB (Messrs. Earl Rhode and Nicholas Stoer) will be at MSFC the week of September 15-19. They have requested briefings on the following topics: Overall Center Missions and Organization, Center Budgets, Employment Situation, Support Service Contractor, Saturn Launch Vehicle Production, Apollo Applications Program, Science and Engineering Directorate Activities, and Advanced Missions. In addition, a trip to MAF and MTF is planned. Mr. Don Ryan (MSF Institutional Operations) will accompany the BOB representatives on their visit. A member of the Staff luncheon group will accompany the visitors throughout their visit. ✓

FY 1970 BUDGET, SENATE AUTHORIZATION - NASA has been requested (September 8) by Senator Proxmire to breakdown the FY 1970 Apollo authorization of \$1.691 billion. He also requested that NASA provide him with the cost for launch rates of two and one flight per year plus close out costs if the Apollo program were not continued beyond flights already authorized in previous years.

We understand from Headquarters contacts that Senator Proxmire plans to propose a \$1.0 billion reduction to the NASA authorization.

U.B.
Sounds like a broken record by now B

ADP MANAGEMENT - At the ADP Management Decision Group meeting of September 5, Mr. Tuey of Headquarters presented a plan and obtained approval for using Slidell's 3-G computer for implementation of the Manned Space Flight Data Processing System. Dr. von Braun will receive a letter from Dr. Mueller informing MSFC of the plan for which Headquarters will fund all costs including \$30,000 personnel and \$500/month rental for remote terminals to be located in Headquarters, Slidell and Huntsville. Estimated 1108 computer time required is one half hour per day. ✓

The Management Decision Group accepted six months extensions on release of 2-G ADP equipment with a review of the schedule on December 1, 1969. PM, A&TS, and S&E have the action to determine where the funding will be obtained to cover equipment rental for these extensions. ✓

NOTES 9-15-69 BROWN

JK 9/15

West Coast Liquid Hydrogen Support - On September 10, 1969, a new contract (NAS7-800) was awarded to Linde Division of the Union Carbide Corporation to meet NASA's west coast liquid hydrogen requirements. Their price per pound with no guarantee under this contract is about one-third of the price in the existing contract with Linde which expires in January 1970. Under the existing contract, liquid hydrogen was supplied from two plants - a 30-ton per day plant at Ontario, California, and a 60-ton per day plant at Sacramento, California. This contract has one more twelve-month option period remaining covering the unamortized portion of the Sacramento plant which was being depreciated in seven years. In view of the new contract, option to renew will not be exercised. ✓

After paying Linde approximately \$1.5M termination costs for non-exercise of option for the final year, the Project Logistics Office estimates a savings of \$3.3M in CY-70 and about \$4.8M in CY-71 will be realized. ✓

B
2/20

9/31/5

Jim D.
After the
Pocell
presentation
I understand
FMB's
reluctance.
Let's discuss
this issue
Once more
you, Heller,
Stuhlinger,
Lucas and I.
Please
arrange
w/Bonnie
B

1. EXPERIMENT MODULE CONCEPT: Mr. Olivier made a presentation earlier this year to Chuck Mathews on an experiment module concept. This concept was generated during the ATM Follow-on study of last year. Mr. Mathews was favorably impressed with our module concept, which involves the remotely operated module that can be docked to the Space Station and pressurized to provide a shirt sleeve maintenance capability. Mr. Mathews suggested that we make this presentation to the Astronomy Missions Board. We have been trying to get this item on the AMB agenda and have been alerted for the last two AMB meetings, but in each case we have been scrubbed because of time limitations. I consider it is essential that we present the module concept to the AMB. I understand from Dr. Stuhlinger and others that the AMB is somewhat uncomfortable about our module concept as they presently understand it and may consider it grandiose. I believe they are of the opinion that all maintenance can be accomplished by EVA. This opinion has been imparted to the AMB as a result of a GSFC presentation and a study by industry. We are trying to get on the AMB agenda for the October meeting. I would consider it desirable if either Astronaut Dr. Owen Garriott or Dr. Karl Henize could be available as technical backup to support our case regarding the difficulty of EVA maintenance.

2. HIGH ENERGY ASTRONOMY OBSERVATORY: I have been informed by OSSA and by Dr. Stuhlinger that our HEAO presentation to the Astronomy Missions Board was very well received. In an Executive Session following the presentation, resolutions were passed by the AMB endorsing our concept and reaffirming that the AMB considers the HEAO program to be NASA's highest priority new start in astronomy.

A meeting was held at GSFC this week to discuss HEAO data systems and data handling. Our working relationships with GSFC continue to be excellent. They seem to accept our lead role completely and are providing excellent support. ✓

3. STELLAR ATM: Mr. George Anderson of Bellcomm visited us this week to discuss Stellar ATM. Bellcomm favors permanently attached astronomy modules rather than remote modules. Your handwritten comments to my recent Notes on Stellar ATM make your position on this matter quite clear and we are in agreement. ✓ We are drafting a letter (to be staffed by Program Management) expressing our serious reservations about baselining a permanently attached 72" stellar telescope on DWS #2. ✓ We will explain our preference for the solar payload for DWS #2, which is also favored by OSSA and by the AMB. ✓

So that's where the perturbation comes from!!
B

SATURN:

NOTES 9/15/69 GODFREY

B
9/20

9/15

1. Saturn and Engine Follow-On Cost Reduction and Reliability Improvement Changes. The Saturn and Engine follow-on cost reduction changes were presented to Rocco Petrone in a telecon Friday, September 12. Petrone stated that he considered any change to the successful Saturn vehicle to be a major consideration and requires a careful evaluation. He was satisfied at the conclusion that MSFC had done a thorough assessment of the changes and authorized proceeding with implementation. He asked that several changes be reconsidered and presented to him in further detail. These were: changing IU coolant to Oronite 100, F-1 pump modification, elimination ST-124 stress corrosion susceptible materials, C-Band radar removal. This same presentation was given to Dr. Rees Monday, September 8. Dr. Rees also concurred with the changes. Planning is proceeding to implement the changes. ✓

2. Reference your comments on Balch's Notes of 8-11-69 (enclosed). A harsh letter was sent to Boeing on August 15, 1969, immediately after the problems were encountered on S-IC-12. The letter (enclosed) asked Boeing if they were in control of the S-IC program or to indicate if they believed the Government would have to move in. The letter and the incidents have attracted the attention of Boeing top management, who have dispatched a special team to investigate the incidents. Letters were also sent to the managers of MTF and Michoud at the same time, asking for a joint survey of the Government controls. To date, it appears that the problems are a combination of human errors which indicate the need of better Boeing management disciplines and controls, and "growing pains" with the new mode of performing factory checkout at MTF, using a composite checkout and firing crew. Intensive studies of the S-IC incidents are underway by the S-IC Stage Office, Mr. Stamy and Mr. Balch. Mr. Harry Johnstone, representing Karl Heimburg, will continue his special survey of Boeing test crew readiness for firing at MTF, and also participate in the S-IC-12 investigations. We will update you on the final conclusions. ✓

LRV:

MSC presented three "case studies" for lunar exploration at the MCM on September 10. The studies called for 35, 54, and 78-hour lunar stays with various LM configurations. Dr. Mueller instructed MSC to proceed with Case 2 which calls for three EVA's during the 54-hour stay with a modified LM carrying five batteries without a solar array. MSFC was instructed to continue planned activity to place a 400-lb LRV in quadrant 1. As a parallel action, MSFC will analyze weight reductions from reduced LRV range and speed requirements as part of a payload vs LM hover time study. MSC was given two weeks to compile a detailed cost and schedule impact for integrating the LRV into the LM. ✓

2 Enc (to Dr. von Braun only)

NOTES 9-15-69 GOERNER

JK 9/15

HIGH ENERGY ASTRONOMY OBSERVATORY (HEAO): The Preliminary Design Office initiated an in-house activity in support of the High Energy Astronomy Observatory on September 2, 1969. Our initial commitment is to provide the engineering effort required to complete a comprehensive Phase A study by early November and to complete Phase A documentation before December 1, 1969. The Mission and Payload Planning Office is responsible for the overall management of this effort within Program Development. Our engineering effort is being supplemented with the assistance of approximately eight support contractors from the Brown Engineering Company.

In support of this effort, two of our engineers visited Goddard Space Flight Center (GSFC) to discuss proposed experiments and HEAO information requirements. Three specific experiments were discussed with principle investigators: (1) Gamma-ray Telescope, Dr. Fichtel; (2) Low Energy Gamma-ray Detector, Dr. Frost (Dr. Dennis spoke for Dr. Frost); (3) Cosmic-ray Calorimeter, Dr. McDonald. Several of the prospective experiments have been flown on balloons, and similar, but smaller, designs have flown on small spacecraft.

Dr. Fichtel hosted our group at GSFC and made all the arrangements.

Dr. Albert Boggess conducted a tour of the OAO control center; an OAO spacecraft contact with the Rosman, N. C., tracking station was in progress. Dr. Boggess is a principle investigator for the telescope on the next OAO. He informed us that the present OAO control center is to be increased to handle two spacecraft to accommodate the follow-on OAO.

A new and similar facility might be required to support the High Energy Astronomy Observatory. This requirement will be explored in subsequent meetings. ✓

JK 9/15

1. S-II AIR FORCE QUALITY SUPPORT: The Air Force has supported our Seal Beach Quality operations with 18 competent people over the years. Due to a space squeeze, the Air Force is negotiating with NASA Headquarters to either transfer these spaces to NASA or significantly reduce them. Of course, NASA cannot take on these additional people under today's environment; however, we are trying through John Condon to minimize the impact by phasing the reduction slowly over a long period of time. The loss of these trained and knowledgeable people will hurt in the support of the follow-on. ✓

2. OTHER MANPOWER LOSSES: The drain on our engineering work force over the past year and a half has been significant and crippling. We have lost about 20 percent of our engineering work force since January 1968. The rate of loss has been increasing during 1969 due to transfers to CSE and PD. The effects of these losses have been particularly serious in our system checkout area where we were always marginal due to the special skill required. The losses in our Quality and Reliability Engineering Division are also serious. This Division had a makeup of young engineers and consequently has been hit very hard. We have lost our ability to adequately check out the ATM while continuing to properly monitor other checkout activities. We have also lost our capability to adequately provide the detailed attention to all procurements as we once did. However, I want to assure you that we will do our best in priority areas to the limit of our resources. ✓

Dieter R.

I share your concern. But if this Center has to have a lively future, we just got to get some of our most experienced people into the development of new programs such as the shuttle or the space station. I'm sure you understand. B

12 James
Do you
think
Phillips
could stop
that?
B

NOTES HAEUSSERMANN 9/15/69

9/15/69

B 9/20

Your conversion of the words in my 8/19/69 NOTES to a drawing is precisely correct. ✓

Since this NOTE, Bill Schenider has been informed of our decision not to further pursue the proposed change. ✓

NOTES 9-15-69 HEIMBURG

B 9/20

9/15/69

1. S-11-12 CENTER ENGINE LOX LINE: Corrosion has been found on the torsional bellows center lox line of S-11-12. The line had failed to pass leak check on 9-5-69. The same bellows assembly is used on the center LH₂ line and outboard LH₂ lines on S-11-7 and subs. It is also understood that the same bellows is used on S-IVB. Solar has dissected the S-11-12 bellows. Numerous yellowish-brown spots an eighth to a quarter of an inch in diameter were found in the bellows. Thirty-two were corroded completely through the material. North American and Solar are investigating five possible areas: Poor inprocess control (residual trichloroethylene), grinding dust, bad base material (impure 321 stainless), lubricant, and water entrapment. NR is considering designing a bag to perform regular check on S-11-7. Materials Division is attempting to find the lubricant material to prepare specimens for humidity test over the account.

2. ILRV FEED SYSTEM: The impact of various engine thrust sizes on ILRV propellant feed systems has been assessed. Using an assumed vehicle geometry and preliminary pump data, it was found that manifolding two engines with a "y" duct would not necessarily impact the design. Weight savings from manifolding are minor, and if more than two engines are manifolded from a single feed line, lox trapped in a manifold would represent high mass-residual penalties. Non-geyser criteria during ground hold will dictate at least two lox lines to each tank, and design simplicity will dictate symmetrical manifolding so that all feed systems will be nearly identical. Studies are continuing in this area.

3. IBM STRUCTURAL ANALYSIS SUPPORT FOR THE SATURN V DRY WORKSHOP: Personnel of this laboratory met with PM-SAT-IU last week. Agreement was reached that the requested support was required. IBM was directed to coordinate with S&E-ASTN-A and develop a work scope in the form of a preliminary ECP. Informal coordination has been completed. A meeting was held 9-11-69 with PM-SAT-IU, IBM and personnel of this laboratory to finalize the work scope.

4. LRV CREW STATION CONCEPT EVALUATION: We are actively involved in the development of a new crew station seating concept for the LRV program called a saddle seat. The advantages of this type seat over the conventional seat are primarily greater seating comfort, better visibility, faster ingress-egress for application with the Apollo A-7L spacesuit and Portable Life Support System (PLSS). A part-task wood mockup of this concept was built in-house and tested in the Human Factors Engineering Laboratory in building 4619 during the week of August 25. Time and motion picture analyses of the test data indicated the superiority of the saddle seat.

5. GENERAL: Schedules continue to be seriously hampered by problems with the Univac 1108 computer facility. In addition to completely losing many runs because of the system, short runs (one minute or less) have required up to 6 days turnaround time and long runs up to 10 days. Chronological records of these problems are being kept. The burden of administrative requirements, on the computers also adds significantly to the problems of available computer time for technical purposes.

PM
Impact
serious?
B

Maxe
Newberh
Can
you
help?
B

NOTES 9-15-69 Heller

7/9/15

B3/20

No submission this week.

NOTES 09-15-69 HOELZER

B 9/20

9/9/15

1. POST FLIGHT DATA REDUCTION: The Engineering Computation Division is making plans to reduce the post-flight data from AS-507 on the GSA 7094 computers since the UNIVAC 1108 apparently does not have as yet the capacity to accommodate the commercial, data reduction, and scientific workload generated for it. The AS-506 post-flight data was reduced almost entirely by the UNIVAC 1108, using half the processor time formerly required by the 7094. The LIEF/HOSC real-time support and the quick response trajectory analysis will of necessity remain on the UNIVAC 1108. ✓

Maxe
Neubert

see
Heimburg
Notes

9-15-69

2. ASSISTANCE TO UNIVERSITY OF ALABAMA: Professor John Karrh, Civil Engineering Department, University of Alabama, Tuscaloosa, visited Data Reduction Branch on September 8 and 9, 1969, for the purpose of obtaining advice on instrumentation and recording of strain data on various bridges in Alabama. He also wanted help in analog to digital conversion. Professor Karrh's project is funded by the Department of Public Roads and is intended to measure stress, strain, and fatigue on bridges. His digital data will be reduced and analyzed on university computers; Computation Laboratory will provide analog to digital conversion on a time-available basis. ✓

B

9/15/69
1. OUTER PLANETS EXPLORATION: We understand that the OSSA Planetary Programs Office (Don Hearth, Bob Kraemer) made a recommendation to Dr. Naugle on 9-8-69, as to Center assignments for the Outer Planets Exploration program. Dr. Naugle was to take these recommendations under consideration for a few days. We have heard no further developments yet.

Although the content of the Hearth-Kraemer recommendation was not made known to us, Mr. Kraemer did indicate, subsequent to their input to Dr. Naugle, that MSFC is still in strong contention for the job.

2. TITAN III FOR HIGH ENERGY OBSERVATORY (HEAO) PROJECT: The Titan IIID is the baseline launch vehicle in current planning for HEAO launchings (Titan III with 5-segment solids, no TranStage, radio-command guidance). Launchings from ETR are planned, in order to get the desired low inclination orbits. Several factors are being investigated at present which could possibly result in additional consideration of Titan IIIC (with TranStage), or other alternative launch vehicles.

a. The present combination of payload weight, target orbit altitude and orbit inclination use full capability of T-IIID (no re-start capability in final stage limits flexibility in orbit altitude and inclination).

b. The Titan IIID is presently operated from WTR, only; adaptation to ETR is under study. We understand that the BTL (Bell Telephone Labs) radio-command guidance is to be phased out at ETR in the early 1970's, due to plans to switch the Delta vehicle to inertial guidance. If this is confirmed, it would be necessary to sustain this operation for T-IIID, or to equip the T-IIID vehicle with an inertial guidance system.

These questions are being worked in support of HEAO mission and project planning by Jim Downey and Carroll Dailey. We will advise more information later.

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8/15/69 HUETER NOTES
9 8/15

B 9/20

No submission this week.

NOTES 9/15/69 JOHNSON

B 9/20

9/15/69

Proprietary Rights to Space Processes - Mr. Stanley Smolensky, Code E, Headquarters, is to visit MSFC September 23 to discuss possible legal arrangements to allow industry to have proprietary rights to space processes. The AAP Office is coordinating this meeting. ✓

SRT Annual Progress Report - This report is now in printing and will be distributed during this week. The 741 page document reports the progress made during the period August 1968 through July 1969 on those Advanced and Supporting Research activities of the Center which were funded by the four Program Offices in Headquarters. The progress of each task is described in brief narrative form along with the names of principal personnel involved and publications issued. ✓

OART Supporting Research Programs - (Reference 9/2/69 Notes, copy attached to DIR and S&E-DIR only). Bruce Lundin is pulling together funds to be earmarked specifically for Shuttle. In doing this he is having to reduce guideline figures previously provided some of the Centers. The \$13.5M guideline given MSFC in February 1969 was adjusted downward to \$11.8M in July 1969. We anticipate no further change of any significance in that figure. ✓

NOTES 9/15/69 MOHLERE

9/9/15

B 9/20

No Submission

Mr. Garmon

CORRECTED COPY

10-9-69

Rec'd
SEP 19 1969
Rep - m

NOTES 9/15/69 MOORE

1. TELESCOPE ON MADKIN MOUNTAIN: The 24-inch Cassegrain-Coude Telescope has been delivered to MSFC. This telescope was built by Goerz Optical Company of Pittsburgh, Pa. Installation of the telescope is now in progress. Tests on the polar axis this week indicate that the wobble on that axis is approximately ± 1 arc sec. This is well within the specifications and is considered excellent. When this telescope is completed, it is expected that the absolute blind pointing accuracy of the mount by computer control will be 2 to 3 arc sec. The Optical Communication Transceiver Package that is to be mounted at the Coude focus is due to be delivered from Perkin-Elmer the week of September 22, 1969. For the application of optical communication and tracking, this telescope facility should be the best of its kind in the U.S.
2. FUEL CELL SUPPORTING RESEARCH: Procurement actions for the extension of R&D efforts on fuel cells for future applications have been processed for approval. One extension is for heat rejection analysis to evaluate heat pipe application on fuel cell systems. This effort is with GE. A contract with ESSO Research is being extended to perform empirical analysis of thin film fuel cell electrodes.
3. CMG's: Control Moment Gyros serial numbers 1 and 2 are now in the ATM Simulation Facility and are mounted in a torque measuring stand. At the present time, dynamic response and torque tests are being performed.
4. AS-506 CROSS RANGE (Y) VELOCITY ERROR: At T + 3 seconds into AS-506 flight a 1.8 Meter/sec. velocity guidance error occurred. The most likely cause of this error has been attributed to the ST-124M Platform Y Accelerometer float deflecting to its mechanical stops. It is also considered that excessive vibration on the ST-124M Platform mounting structure may have caused the excessive deflection. Sufficient measuring instrumentation was not available on AS-506 to completely evaluate this anomaly. Astrionics has recommended approval of an IBM ECP which would provide the following AS-507 changes: (a) Add X, Y, and Z ST-124M Platform Mounting Structure Vibration Measurements - these measurements were not on AS-504 thru 506. Structural changes have been made on AS-505 and subs which could have affected the structures vibration response. (B) Add the X, Y, and Z accelerometer float deflection measurements to FM Telemetry to provide continuous monitoring of the deflection. On AS-506 these measurements were commutated at 120 samples/second. (c) Change the Y accelerometer encoder measurement to a higher frequency response channel, for better evaluation of a similar guidance error. A navigation update capability presently exists on the AS-507 vehicle in case one is required. The IU/S-IVB must achieve earth orbit to use a navigation update.
5. ATM QUARTER RACK TESTS: Results of ATM quarter rack testings of a CMG and a CMG Inverter Assembly (CMGIA) in the ASTN thermal vacuum chamber have been analyzed. The heat flux inputs during these tests, based on the wet workshop configuration, give satisfactory temperature performance of the CMG and CMGIA although the temperatures are on the cold side. The dry workshop heat flux values are expected to be slightly higher which will improve the CMG and CMGIA temperature situation somewhat.

NOTES 9/15/69 MOORE

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B 960

Brooks M

Please advise me when ready for a

little informal inspection B

B.M.
Did
P.M.
60V
this
recom-
mendation
B

NOTES 9-15-69 SIEBEL

B 9/20

8/19/15

1. ATM: To ensure correct cable lengths and proper routing in the ATM Spar, we are building a "cable routing mockup". This will also verify three-dimensionally the correct fabrication of the cables. Further cable routing mockups of critical ATM areas will be built. ✓

2. ATM Camera: The electrical portion of the work on a flight camera for the H-Alpha experiment is complete with the incorporation of an EO for minor hardware change. Functional checkout in the shop (with the ASTR designer) has already been performed. Upon completion of the mechanical assembly and check, the camera is to be delivered to ASTR. ✓

3. Neutral Buoyancy: The Airlock Module has been installed along with a work station that represents the ATM sun-end work station. The phantom work station will allow preliminary translation studies to proceed without the actual ATM being installed. Testing on this configuration is expected to begin this week. ✓

4. Alabama Space and Rocket Center: We are in the process of installing the F-1 engines on the S-IC stage. This month also we will lift the S-II stage from the S-II transporter because it is needed for the S-II program. We will substitute a different transporter which can remain at the museum. ✓

NOTES 9/15/69 SPEER

B 9/20

9/15/15

1. LIEF Cost Reduction: We presented to Lee James our plans for effecting cost reductions in the LIEF system based on assessment of post-lunar landing activities. Our prime criteria in this activity has been to reduce costs to a minimum while maintaining a usable LIEF System (both Apollo and future programs). Basically the cost reduction is: (1) conversion of wide band circuits to Common User Data Network; (2) reduce voice lines from 22 to 16; (3) reduce TV costs by 60%; (4) reduce LIEF internal instruments by 10%; (5) freeze configuration of display system; and (6) utilize common contractor for S&E-COMP and PM-MO LIEF tasks. These reductions amount to about 50% of our current costs. We expect to present our plans to Gen. Stevenson in the next few weeks. ✓

F.S.
Sounds like
a very
worthwhile
study B

2. Advanced Computer Study: Dr. Turnock, OMSF, Chairman of the Advanced Computer Task Team, formed by Dr. Mueller, met with the Mission Approach and Consolidation Group for a kick-off meeting on 9/11. The group is to define a simplified operations concept for post 1974 missions considering tradeoffs on consolidation of launch and flight operations at KSC and the use of autonomous onboard systems. The principal goal is to reduce present computer and operations costs by 50%. The study activities will start this week with a two-day session at MSC. ✓

3. Saturn IB Wind Limits: We have been working with S&E to raise the AAP Saturn IB vehicle ground wind constraints since the AS-205 wind limits (as low as 25 knots) were considered very restrictive by KSC and the AAP launch window is expected to be very short. Two of the three means, identified to date, require extensive vehicle or umbilical tower mods and appear unrealistic. The provision of a windshield by use of the service structure during the critical portion of prelaunch operations is the third and most feasible alternative to accepting the present limits. The use of the service structure would be a contingency operation in the event of marginal winds up to 48 knots. No operational problems are evident in this mode, but we have asked KSC to evaluate pad safety considerations when leaving the service structure at the vehicle during cryogenic loading. ✓

NOTES 9/15/69 STAMY

B_{9/20}

Nothing of special significance. *JF 9/15*

B3/20

NOTES 9-15-69 Stuhlinger

9/3/15
1. DR. TELLER'S VISIT: Dr. Edward Teller's visit is now planned for September 30. However, final confirmation of this date has not yet been obtained. The agenda for the visit, which will include speakers from S&E and PD, and from Aerojet General, will be firmed up this week. ✓

2. DR. ALVAREZ' VISIT: Dr. Alvarez and Dr. Anderson (Berkley), and Dr. Hagge (MSC), will visit this Center probably late in October or early in November. ✓ A firm date has not yet been established. The main subject to be discussed is the Cosmic Ray Laboratory planned for the Space Station. PD will prepare the agenda for this visit. If you would like a briefing on the scientific background of Dr. Alvarez' project, please advise. *yes, and a basic description of*

3. FUSION REACTION CONTROL PROPOSAL: Dr. Winterberg, University of Nevada, gave a presentation to a small group at MSFC on a proposed approach to the problem of fusion reaction control. In order to avoid the problem of magnetic containment, a pulsed mode is proposed, each pulse being short as compared to the diffusion time constant of the reaction products (nanoseconds). Ignition of each "microbomb" in a continuing series is achieved by a pulse of fast electrons on a pellet (0.5 cm diameter) of liquid or solid heavy hydrogen. The electrons, before forming the energetic pulse, are accumulated and stored on a superconducting ring. Most of the energy of each explosion could be converted directly into electric energy by inductive coupling between the fast moving hydrogen and helium ions and a coil system surrounding the explosions. We advised Dr. Winterberg to seek funding support through Los Alamos Scientific Laboratories or Oak Ridge National Laboratory, and possibly LeRC or JPL. It appears likely that his theoretical results can be verified, at least to a certain degree, with relatively small scale, low cost experiments. *the Cosmic Ray Lab.*

↖ E.S.

*That sounds awfully exciting.
Let's talk about it some more*

B



GEORGE C. MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE, ALABAMA

TO Dr. von Braun, DIR ✓

DATE September 17, 1969

FROM W. A. Mrazek, PD-DIR

Thanks. Very concise and
useful information.

SUBJECT Comments to Johnson NOTES 8/25/69

B 9/20

I can readily understand Bill's frustration. I feel the same way. There is an agreement, however, between George and Bruce that OART will direct the necessary Shuttle and Space Station Supporting Research and Technology as well as the Advanced Systems Development.

MSF, as junior partner with little or no money invested at present, tries to tap the funds still available in OART. Due to the late initiation of this agreement, certain amounts of the OART money had already been released to all Centers and committed.

Now, Del, who is fully in charge of the supporting role of OART to MSF, has the difficult task of directing and redirecting the proposals submitted by all Centers into channels acceptable to the Shuttle and Space Station development without completely paralyzing other R&D work going on in the OART Centers. Del has established Task Committees to help him screen and approve the multitude of submittals. It is in our interest that we in MSF cooperate with OART in order to benefit the utmost from OART funds otherwise not available to MSF. In this process, it is unavoidable that our own proposals receive the same screening as all others. ✓

At the outset, I requested S&E to support this activity, namely by nominating strong men to the different technology committees. The following men represent MSFC's interests in the different committees:

Aerodynamics

Mr. W. K. Dahm

Integrated Electrical
Systems

Mr. H. Hosenthien

(I finally succeeded in obtaining participation by Bill Horton)

Thermal Protection

Mr. E. C. McKannan

Sept. 22, 1969

7.F.7/12
S-1C-12 - Although the stage contractor is presently running slightly behind schedule, no impact is expected to propellant load test scheduled for 10/15/69 and 10/16/69, or static firing, scheduled for 10/22/69. ✓

S-II-9 - Stage is in the vertical position in the Stage Checkout and Storage Building undergoing insulation modification. ✓

S-II-10 - Stage contractor has rescheduled static firing from 9/24/69 to 9/25/69. A requirement for engine helium regulator change-out could cause a slip of one day, and there is also some doubt that the service contractor will have progressed sufficiently with site restoration activities after Hurricane "Camille" to support the stage contractor's schedule. ✓

S-II-11 - Stage arrived at MTF on 9/17/69 and was installed in the A-1 Test Stand on 9/18/69. Stage and GSE hook-up is presently in progress for "power-up" on 9/26/69. Cryogenic proof pressure test and static firing are scheduled for 10/18/69 and 10/29/69, respectively. ✓

Legal Affairs - On 9/15/69 through 9/17/69, 5 of the 6 suits against the Government for damages allegedly resulting from static testing activities at MTF were heard before Federal District Judge, Walter L. Nixon. Judge Nixon ruled in favor of the plaintiffs and awarded them damages totalling \$27,000.00 ✓ *> May set a precedent! B*

The plaintiffs and their neighbors, 15 in all, testified that the noise was severe, that their homes vibrated considerably, and that their concrete block homes and buildings cracked severely during the tests.

The Government's acoustic and construction experts testified that the sound level in the area of the plaintiffs' homes (115 db) was well below, that which would cause damage to concrete block structures (142 db), that the structures in question had been cracked for some time, and that the structures were both old and substandard. The Judge apparently felt that the testimony of the Government experts was outweighed by the other testimony presented.

The possibility of appealing the decision is being considered in conjunction with evaluation of the approaches to be taken in regards to the remaining suit and claims. This matter is receiving considerable attention, and a more definite course of action should appear within the next two weeks. ✓

Bureau of the Budget Field Trip - Representatives from Bureau of the Budget, accompanied by NASA Headquarters and MSFC personnel, were at MTF 9/17/69 on the annual Bureau of the Budget Field trip. The entire group, accompanied by MTF representatives, were also taken on a tour of the Gulf Coast area damaged by Hurricane Camille. ✓

NOTES 9/22/69 BELEW

Bg/25

TV DOWNLINK: (Reply to Comment on Notes 8-11-69) A TV downlink is baselined for the manned portions of the mission utilizing the Command Module S-band System. The Principal Investigators desire to have unmanned operations with TV downlink capability. MSFC is evaluating the P.I. requests for TV downlink during unmanned operations and will apprise Mr. Schneider of the schedule impact and cost the week of September 30, 1969. ✓

HABITABILITY SUPPORT SYSTEM COMPONENT FLIGHT TEST:

On September 17, 1969, personnel of the MDAC-WD and Fairchild-Hiller met with S&E-ASTN for discussion of hardware, test, and specification requirements for the proposed AAP fecal collector flight test on Apollo. MDAC-WD has indicated they can support both the Apollo proposal and AAP development with the required test and flight hardware. ✓

ASTRONAUT VISIT TO MDAC-WD: Astronauts Don Eisele and Bruce McCandless visited MDAC-WD for discussions on layouts of the Habitability Support System (HSS) food, waste, and sleep compartments. A return visit by the astronauts to MDAC-WD is scheduled for September 25, 1969, for further review of the food area. ✓

TELEPRINTER: The decision made by Mr. Schneider, at the Baseline Meeting September 17-18, 1969, to put the teleprinter in the Airlock Module will not be implemented contractually until some agreements have been reached as to the approach, i.e., criticality rating, extent of qualification required, redundancy, etc. We will solicit inputs from MDAC-ED in finalizing the approach. ✓

MSC/MSFC OPERATIONS INTERFACE MEETING: A meeting on the above subject will be held at MSC on September 23 with Thompson, Slayton, Kraft, etc., from MSC, and James, Belew, Speer, Richard, Hacussermann, McDonough from MSFC. Now that MSC has established means of influencing design, MSFC wants to set up similar means of monitoring, influencing and signing off on key documents covering MSFC hardware to be operated by MSC. ✓ Preparation and issuance of mission documentation is one area of MSFC input and the other is doing the actual mission operation. The MSFC approach is to secure an understanding, to be formalized later, with MSC that is similar to our relations with KSC between hardware and operations. ✓

UNMANNED OPERATION ATM: The ATM system impacts for the selected unmanned operation modes are under study and are scheduled to be completed on September 23, 1969. ✓

9/22

B 9/25

Senate Action On FY 70 Authorization - With only a few Senators present, NASA's FY 70 Authorization passed the Senate by voice vote on Friday, September 19, at the Senate Committee recommended level of \$3.715B. Sen. Yarborough (D-Tex.) sponsored amendments to increase the Senate bill by \$250M and by \$130M, but both were defeated. Sen. Proxmire put in the record his amendments to reduce the bill by up to \$1B, but did not bring them to a vote. Proxmire said that after 40 days of debate on the Military Procurement Authorization Bill, the Senate was too fatigued to give proper consideration to this NASA bill, and he would therefore save his amendments for the Senate appropriations debate. The \$3,715.5M Senate bill and \$3,966.3M House bill will now go to conference for resolution of differences. The comparison of actions to date is as follows:

	(Dollars in Millions)			
	Nixon <u>Request</u>	House <u>Auth.</u>	Senate <u>Auth.</u>	House <u>Approp.</u>
R&D	3,006.4	3,264.4	3,019.9	3,000.0
C of F	58.2	58.2	58.2	53.2
R&PM	<u>650.9</u>	<u>643.7</u>	<u>637.4</u>	<u>643.7</u>
TOTAL	<u>3,715.5</u>	<u>3,966.3</u>	<u>3,715.5</u>	<u>3,696.9</u>

Headquarters personnel indicate they cannot predict when an Appropriation Bill will be passed since the whole process is behind schedule. Therefore they are making plans for operation through December under a continuing resolution. ✓

Bureau of The Budget Visit - Messers Earl Rhode and Nicholas Stoer from the BOB, accompanied by two MSF personnel, visited the Center September 15-19. This was the first time at Marshall for both, therefore, the briefings were primarily general orientation in nature. During the visit the following items were covered: briefings on Saturn, Engines, AAP; tour of Center laboratories; trip to MAF and MTF (including tour of Camille disaster area); discussion of Center manpower and budget; briefing on future program planning.

In general the interest of the BOB visitors centered on AAP, potential future programs, and the MSFC in-house capability. A few specific areas of interest were:

1. Impact on MSFC capability of manpower reductions and restricted hiring policy.
2. Approach to reducing cost of follow-on Saturn V production.
3. Background on decision to eliminate static firing.
4. Retention of capability of MAF during program hiatus.
5. Future utilization of MTF.
6. MSFC position on priority of Space Shuttle and Space Station if only one could be started. ✓

An interesting comment concerning the STG report made by both BOB visitors was that it gave the President the program he wanted (Space Shuttle, Space Station, Manned Planetary) but not at a reasonable funding level (4-5B per year). Because of this, NASA may be faced with a continuing year by year approval of its program. ✓

B 9/25

9/25/69
J-2 ENGINE: (Bellows Leakage Problem - Comparison of S-II-12 LOX Feed Line and J-2 Fuel Inlet Duct on S-IVB-508:)

A leak was discovered in the S-II-12 center engine LOX feed line on September 11, 1969 during post manufacturing leak check. The leak was traced to the torsional relief bellows section where approximately 32 pin hole leak paths were eventually identified. Cause of the pin holes appeared to be external corrosion such as might be caused by an acid or caustic solution. Improper cleaning during manufacture is suspected. The bellows itself was identified as having been fabricated by a firm named Gardner which also supplies similar torsional relief bellows to Solar for fabrication of the J-2 engine fuel/LOX inlet duct bellows. ✓

A similar leakage problem had been previously discovered in April 1969 on the J-2 Engine Fuel Inlet Duct on S-IVB-508. Rocketdyne removed the duct and found corrosion and one pin hole leak. Ten other engine inlet ducts were selected at random for inspection and no leakage paths or significant corrosion were found. Therefore, the matter was presented as an isolated failure in the AS-506 Program Manager's Readiness Review and was closed out at that time. In light of the S-II-12 duct leak, the Rocketdyne Duct Investigation has been reopened. ✓

The following information is available for comparing the two ducts. Both ducts use a Torsion Relief Bellows of very similar design where the corrosion and resulting pin hole leaks were found. Both ducts are fabricated by Solar, however, the torsion relief bellows for the two leaking ducts were fabricated by different vendors, Gardner for the S-II and Fairchild for the J-2 Engine Duct on S-IVB-508.

As a result of the discovery of the above leaks, it was decided to inspect all S-II Stage and S-IVB Stage LOX and Fuel Ducts of similar configuration including all the J-2 Engine Ducts. S-II-7 and S-II-8 have completed inspection and there are no leaks. S-IVB-507 is to be inspected next. The S-1C stage and F-1 Engine Offices are surveying their systems to ascertain if they have any similar feed lines. ✓

Rocketdyne and Space Division are working together to find the cause of the problem; a manufacturing procedural problem such as improper cleaning or passivation is suspected. The problem is to be reviewed further in AS-507 J-2 Engine and S-II Stage Preliminary Readiness Reviews this week. ✓

A special team from MSFC laboratories will be traveling to Seal Beach this week also to take part in the investigations. ✓

9/22

Bg/25

ASTRONOMY PLANNING: In my Notes of last week I mentioned that I considered it essential that we get an opportunity to describe our astronomy module concept, or ASTRA concept, to the Astronomy Missions Board. This will no longer be necessary since Dr. Mueller (or Mr. Mathews) will make a presentation at the next Astronomy Missions Board Meeting. He will cover his entire concept of the Space Astronomy Program. We will communicate closely with Bellcomm as they develop Dr. Mueller's AMB presentation. ✓

J.D.
Let me
know what
transpired!
B

As you suggested, we are getting some conceptual art work accomplished showing Purcell's telescope designs being transported, checked out, deployed, serviced, and retrieved with a Shuttle. ✓ The material will be forwarded to GSFC for possible revisions and artistic polishing for appropriate use by GSFC to show a complementary association between the Shuttle and the OAO Follow-on Program. ✓ Perhaps the Shuttle can prove to be the link that will draw together the OSSA and OMSF astronomy payload planning activities. ✓

There exist the following unanswered questions and problems that we will have to grapple with:

a. Our Space Station Experiment Module concept will require some reorientation to accommodate Purcell's concepts if the program evolves in that direction. ✓

b. We must consider how the telescope technology portion of OTES could be best directed to support and complement the NASA Astronomy Program. ✓

c. Differences persist between Dr. Mueller and OSSA regarding astronomy planning. ✓

9/29/22

B 9/25

1. COMPUTATIONAL SUPPORT PROBLEM: The transition to the third generation computers has created, or revealed, several deficiencies in the MSFC computation resources. Four weak spots seem to cause most of the troubles: First, the design philosophy was more concerned with efficient utilization of computers, than with efficiency satisfying the users (i.e., customers) needs; second, the internal housekeeping or overhead drain on computer capacity was seriously underestimated; third, operational status of the system is now about 2 1/2 years late and still not achieved; and fourth, the "natural" inflation in legitimate computation requirements was not properly considered. Financial restrictions preclude any radical solution and some reduction in the centers capabilities as well as inefficiency in manpower use is unavoidable. To minimize this impact it is necessary to give the using labs and directorates a stronger voice in the use of the available resources. In its own area, AERO has offered (and S&E concurred) to cut its supporting research program by \$100,000 to cover part of the rental of the 3200 computer (medium) and to try to live with one of its two 930's (small) leaving the second one to PD. Also, programs are shuffled between the 1108 and the GSA 7094's as far as possible, even as the administrative controls are cumbersome and restrictive. Attempts of self-help are discouraged by the lack of assigning resources to the user and giving him some freedom to make the best of them. In order to prevent further deterioration of the situation, the user labs, and particularly AERO, being strongly analytical-computational oriented, need a voice in computer planning. This applies as well to the present emergency as to the future, e.g., the 4th generation. A first step was taken by arranging for AERO's participation in the Action Data Processing Council (Neubert's group) and the Fourth Generation Planning Groups.

Maxe
Neubert
FYI B

2. LOCKHEED'S C-5A FACILITIES: On September 18, 1969, together with other representatives from Aero-Astrodynamics Laboratory, CSE, and Astrionics Laboratory, I visited Lockheed's C-5A facilities in Marietta, Georgia. Of particular interest were the simulations for the C-5A and their implications for our work on the Space Shuttle. We had an opportunity to participate in the simulation of an airplane landing and to get the feel of the realism of the approach. The runway was projected on a screen and viewed through a collimating lens in the cockpit. However, it became apparent in discussions that there is a controversy among various groups in the country on the question of using a 0-degree-of-freedom simulation (fixed base cockpit), 3-D or 6-D (all-axes motion generator) and what represents the best compromise between contradicting requirements (cost, realism of simulation, flexibility to changing missions, etc.). We plan through the Space Shuttle Simulation Task Team to pursue the question further to have all information available that may be needed when a choice between various simulation approaches for the Space Shuttle has to be made.

✓ AM

JF 9/22

B 9/25

1. S-IVB/IU Lunar Impact. A change proposal requested by Headquarters to impact the moon with the IU/S-IVB on SA-508 has been approved by Rocco Petrone. This change modifies the software for real time lunar impact correction and provides a battery to supply the CCS transponder to lunar impact for tracking accuracy. ✓
2. Corrosion of Engine Feedline Bellows. Investigation of the cause of leaks discovered on S-II-12 center engine LOX feedline revealed extensive corrosion on the torsion bellows manufactured by Gardener and assembled into the line by Solar. Approximately 30 small holes were found in the bellows. A similar bellows, made by Gardener and two other vendors is installed by Rocketdyne on each J-2 engine. A similar bellows, made by Gardener, is employed in the center engine fuel line. The defective bellows has been sectioned and NR/SD, Solar and Gardener are making analyses to determine what foreign elements are present. A team has visited Gardener and Solar examining processes and materials to which the bellows are exposed. Friday, September 19, 1969, we met with Mr. Kingsbury and his people to discuss with SD and Rocketdyne the status on the corrosion of the bellows. The source of the corrosion has not been determined to date. It appears this is a general corrosion problem with both Rocketdyne and SD having current problems. Therefore, Rocketdyne and SD plan to compare and establish in detail the processes used by their respective vendors during the sub-assembly and assembly of the bellows to help isolate the problem. S&E-ASTN has a man on the west coast working daily with Rocketdyne and SD on this problem. Backup feedlines are being allocated for AS-507 and another leak check of the bellows is planned between CDDT and launch. This check was accomplished on S-II-7 and S-II-8 during the week of September 15, 1969, and showed no leakage of the engine and stage bellows. This test does not clear the bellows of corrosion, and inspection may also be required. We will have the plan of action to clear Apollo 12 finalized by early next week. ✓
3. F-1 Engine Step Thrust. We are investigating the feasibility of incorporating the step thrust on the F-1 Engine on vehicle 514 in the event the J-2S is delayed due to development problems. Payloads of 107K or 108K may be required in that time frame. CSE will provide an assessment of the impact on various vehicle systems and identify the analysis required to incorporate step thrust by September 30. ✓

9/22

B
9/25

SPACE SHUTTLE COMMONALITY STUDY

Our Office initiated a study of booster/orbiter commonality two months ago using the General Dynamics/Convair (GD/C) triamese configuration for analysis. A detailed investigation has now been completed on the merits of both vehicle and major-subsystem commonality with regard to the effect on gross lift-off weight; the data have been made available for cost assessment if further study is deemed necessary.

Three degrees of booster/orbiter commonality were assumed for each subsystem:

- (1) Subsystems completely identical in both boost and orbital stages
- (2) Subsystems optimized for the boost and for the orbital stages
- (3) Subsystems compromised for use in both the boost and orbital stages, i.e., essentially the same subsystems, but with minor hardware modifications, off-loading of propellants, batteries, etc.

For each of these assumed degrees of commonality, the impact on gross lift-off weight was determined using the weight sensitivity for the analyzed configuration. Designs approaching complete commonality showed a penalty in gross lift-off weight as high as 1.5 million pounds.

It appears that subsystem commonality for space shuttle configurations is primarily desirable for those subsystems which have small impact on vehicle gross lift-off weight and are characterized by high cost.

(Our latest assessment of the GD/C triamese configuration indicates the degree of commonality between booster and orbiter subsystems is approximately 67%). ✓

NOTES 9-22-69 GRAU

9/22

B 3/25

No submission this week.

NOTES HAEUSSERMANN 9/22/69

9/23

B 9/25

CSE Relocation: The final move to assemble all CSE personnel into one area

was accomplished this past weekend. Effective today, CSE is operationally

located on the first and second floors of the five-story addition to Bldg. 4610. ✓

NOTES 9-22-69 Heller

B 9/25

9/25/69

1. COOPERATION WITH QUAL LAB: On September 16 Dieter Grau and members of his laboratory gave a presentation on quality and reliability requirements for flight hardware. All members of SSL working on flight experiments attended. The meeting was highly successful in increasing mutual understanding of problems. We agreed on a cooperative effort on specific flight hardware, especially in connection with the Contamination Experiment T-027/S-073, the Spectrophotometer to be flown with D-24, and the Proton Spectrometer which is an operational AAP measurement. Dr. Sieber is in charge of the SSL effort and is the focal point for the cooperation with QUAL. Mr. Grau has appointed Mr. R. Ritch as his one-point contact. Mr. Ritch will occupy a desk in Dr. Sieber's Division on a parttime basis. ✓

2. LUNAR EXPLORATION: At the request of Dr. Haeussermann, I appointed Mr. Bob Jones as the focal point in SSL for the science inputs to the Manned Rover Project. Mr. Jones will also be in charge of SSL's scientific participation in the Lunar Excursion Vehicle and Dual Mode Rover studies in PD. Individual tasks or projects involved are: Lunar Drill, Lunar Sampler, Seismometer, Gravimeter, and possibly soil mechanics instrumentation such as a Penetrometer. One of Mr. Jones' tasks will be to organize, jointly with other MSFC organizations, MSC and Headquarters, a nationwide science team in support of MSFC's lunar exploration efforts. ✓

NOTES 9/22/69 HUBER

B₉/25

9/29/22
1. SPACE TASK GROUP REPORT: After a brief review of the STG report several observations are of interest:

a. No singular plan for the next decade was recommended. However, all the major pieces of hardware were included in each of the three middle options. (Although not stated specifically, these options appear to be the only options the group would support). The major difference in these three options are basically schedule variations. ✓

b. The lunar program appears to be the most severely affected by schedule variations in the options of interest. A three to five year hiatus could occur in manned lunar exploration. No provision was made to get more than three days on the lunar surface in this interim period. ✓

c. No date was indicated for a geosynchronous orbit station. ✓

d. The Integrated Plan that the Center has been defining and analyzing for the last several months does not differ greatly from the options of interest in the report. ✓

In the near future we plan a detailed analysis of the report. We will keep you informed on our analysis. ✓

2. NUCLEAR STAGE/PAYLOADS DEFINITION STUDIES: Study contracts are in progress with Lockheed, McDonnell-Douglas, and North American, to define nuclear stage configurations and potential payloads for early flights. These studies are funded by OART(SNPO) and OSSA. Status after the first two months of effort was reviewed by MSFC and other NASA personnel during the week of September 8, to select specific approaches for more detailed study, and to discuss some redirection as a result of the nuclear shuttle and Integrated Plan. The nuclear stage studies at McDonnell-Douglas and Lockheed are progressing well. NAR(nuclear stage derivatives from S-II) has not yet made as much visible progress. All of the payload definition studies are progressing well. These include Outer Planets missions and payloads (NAR), a Barium Cloud Experiment (Martin-Marietta, under sub-contract to NAR), and Mars Surface Sample Return Missions (Northrop-Huntsville, under sub-contract to MDAC). Summary reviews on these studies will be given at MSFC during the week of October 6, 1969. ✓

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9/22/69 NOTES HUETER

9/22

B 9/25

Negative reply

NOTES 9/22/69 JOHNSON

9/22

B 9/25

Nothing of significance to report.

(Lucas)
NOTES 9-22-69 ADVANCED PROJECTS (PD)

B 5/25

9/9/22

1. LUNAR EXPLORATION PROGRAM PLANNING: During his visit to MSFC in the past week, Ben Milwitsky indicated that the lunar scientists and geologists continue to want long range lunar surface traverses as part of the lunar exploration program. He also indicated that there is a need to define payloads for the follow-on Apollo missions (starting with Apollo 21 to be launched early in 1974) and that MSFC should proceed with the definition of the dual mode lunar roving vehicle to provide an early remote control capability while retaining the features required for crew operations. He indicated that payloads have either been procured or are under procurement for Apollo missions thru 20. These payloads include the current 5 ALSEPs plus an additional buy of two ALSEPs, and four manned roving vehicles for Apollo 17 thru 20. Ben indicated that we should proceed on an expedited basis to plan for the dual mode roving vehicle to be flown as early as Apollo 21 in the first quarter of 1974. ✓

2. SPACE SHUTTLE ACTION ITEMS: The action items resulting from the 9-10/11-69 Management Council Meeting are being worked on; a list of 14 items has been established for in-house work and a list of 17 items has been transmitted to Lockheed, GD/C and Martin Marietta for action. All action items will be completed by 9-29-69. The results will be presented to PD on 9-30-69 and to Center Management on 10-1 or 10-2-69. ✓

The study ground rule data passed out by Dr. Mueller at the last MCM, reflecting his desire to reduce gross weight and development cost, resulted in the following preliminary payload capabilities determined by Aerospace Corp.:

Corp.:	Liftoff Weight Limitation to	Tandem Burn	Parallel Burn
	3.5×10^6 pounds	29,000 pounds	14,000 pounds
	3×10^6 pounds	7,000 pounds	0 pounds

Dr. Mueller intends to discuss these results with Aerospace Corp. on 9-22-69. We will participate in the discussions. We have also worked this problem in-house and our results are even worse than those of Aerospace Corp. ✓

3. SPACE STATION INFORMATION MANAGEMENT: A presentation was made to OTDA and COMSAT at Washington, D. C. on 9-17-69 with emphasis on communication requirements. It was pointed out that the Intelsat could not handle the TV and high-rate telemetry requirements. A suggested solution was to add a 35GHz Space Station-to-satellite link for high-rate data and a 136 MHz link for very low-rate data (such as guidance) during the launch phase. This same 136 MHz link could also provide voice for the Shuttle during launch and docking. ✓

4. SHUTTLE PROCUREMENT PLAN: Headquarters has adopted the MSFC Shuttle Procurement Plan almost without changes and sent it to Dr. Mueller. ✓

NOTES 9/22/69 MOHLERE

9/19/22

B 9/25

No submission this week.

NOTES 9/22/69 MOORE

B
9/25

9/22

1. DRY WORKSHOP ATTITUDE CONTROL SYSTEM: The AAP Level II Change Control Board baselined the S&E recommended concept for the Attitude Control System on the Dry Workshop at its meeting Tuesday, September 16. Although we understand that NASA Headquarters (Mr. Bill Schneider) has not yet agreed with the concept because of its schedule slip possibilities, we are proceeding to create procurement and engineering change paper to implement the Level II CCB decision. We feel that a concept which avoids schedule problems will have to allow mission critical single point failures which may be untenable. Our fear is that a prolonged period of indecision at the Headquarters level will assure schedule delays, technical manpower waste, and increased costs. I have discussed the situation with Stan Reinartz who is working the problem. ✓
2. AS-506 CROSS RANGE (Y) VELOCITY ERROR: Reference my note of 9/15/69, subject as above, copy attached. The Saturn Level II Change Control Board has approved additional telemetry channels to investigate possible accelerometer deflections effective on AS-508. Our request for AS-507 effectivity was disapproved on the grounds it would delay AS-507 FRT three days (but would not delay the launch schedule). We will remain alert to AS-507 opportunities if FRT delays should occur for other reasons. ✓
3. VHF Transmitters: A contract was awarded to Conic Corporation, San Diego, for 10-watt VHF transmitters to be used on ATM for telemetry and tape recorder down-links. This source of transmitters replaces Giannini-Voltex whose production contract was terminated in June 1969 for the convenience of the government at no cost.

B 9/25

SF 7/22

1. Routing of Procurement Actions: Three procurement actions for valves for ESS Biomedical Experiments were forwarded September 3, 1969, to the Finance Office for processing. These actions are rubber stamped "BIOMEDICAL" in order to get special processing attention. A follow-up to determine status of these actions was made on September 15, 1969. After calling the many offices that make approval, it was determined that these actions were lost somewhere between Finance (A&TS-FIN) (two places), Planning and Resources Office (S&E-PR), and AAP Office (PM-AA). New copies of our procurement requests were made and handcarried as far as the AAP Office. One action was approved for funding, the other two actions are being held for lack of funds. Information copies were given Purchasing and they agreed to request quotes pending availability of funds. This is an example of the procurement approval route that most of our actions must follow. In addition, approvals by the Reviewing Official, Project Engineer, and Engineering Manager add to this total cycle. In many cases only one person in the approving office can approve the action and if he is on leave or travel the action normally sits and waits for his return. It would seem this labyrinth could be circumvented if some of these approving offices would be satisfied with just an information copy of the procurement request. I am sure that this laboratory is not the only one concerned with the problem of routing and approval. The follow-up and handcarrying required on these procurements consumes an amount of manpower which we think neither ME nor the other organizations in the Center can afford.

2. ATM: Three new fixtures are being designed and built as a result of the program overhaul and the new structural and assembly manufacturing requirements. One is a new structural station for installation of the outriggers and the other two are duplications of existing stations. These newly created stations eliminate major fixture restraint problems on the ATM program.

3. Saturn V: We are fabricating parts required to install the S-II vent valve for the S-II Vent Valve Stability Test.

lay E
Please ask
Wendy B. Day
to make an
expedited study
of this
"labyrinth" and
come up with
suggestions
for procedural
improvements.

NOTES 9/22/69 SPEER

B 9/25

9/22/69

1. Apollo 12 Landing Site: The planning activity associated with the Apollo 12 landing at the Surveyor III location is becoming fairly firm. The decision to land at this site must be made at approximately 5000 ft. altitude and the LM must be within 1/2 mile of the Surveyor for a visit attempt to be made. The Surveyor is located in a crater about 600 ft. in diameter with a depth of about 60 ft. and will be in the shade during landing. The objectives of the visit and their priority are: (1) photography of both the lunar surface and the Surveyor; (2) return of surface samples within the crater; and (3) return of Surveyor III parts. The only tool that will be utilized in removing parts is a bolt cutter. With regard to the surface samples from the crater, it is desired by the scientific community that specific samples previously identified from the Surveyor III photographs be returned. It is also planned to impact the LM ascent stage on the lunar surface after crew transfer. This will be ground commanded in revolution 34 and should impact within 50 miles of the landing site. ✓

2. Apollo 12 Mission Rules: We have agreed with MSC to accept new ground rules for the second S-IVB burn (TLI) on Apollo 12. Except for catastrophic risks, no L/V malfunction would result in a NO-GO decision since MSC has increased confidence of safely handling premature S-IVB cutoffs. This will eliminate previous NO-GO mission Rules based on engineering judgments of the probability of achieving TLI. ✓

3. AAP Operations Interface with MSC: After many delays we plan to meet with top MSC officials on Tuesday (9/23) to discuss the operations interface between the two Centers in AAP. Key points of the discussion will be MSC's requirement for on-site contractor support (engineering assistance) and our requirement for reasonable limitations on scope and magnitude of this effort, and our requirement for formal channels for MSFC engineering input to flight operations. In a dry run here on last Friday, PM and S&E reached agreement on the approach to be taken in this important meeting. ✓

NOTES 9/22/69 STAMY

9F 9/22

B 9/25

VISITORS TO MAF: On Tuesday, September 16, a group of 76 Italian Officers and Midshipmen of the Italian Navy Training Vessel "San Giorgio," accompanied by Dr. Alfredo Lenzi, Consul General of Italy, and Commander Boido, Italian Naval Attache in Washington, D.C., visited the Michoud Assembly Facility. The group was given an orientation and tour of the facility. ✓

On Wednesday, September 17, Messrs. Earl D. Rhode and Nicholas S. Stoer of the Bureau of the Budget, accompanied by Mr. Don Ryan, OMSF, and Mr. Bill Teir of MSFC, were briefed by the MAF Manager following which they were introduced to the managers of the prime contractors at Michoud and were conducted on a tour of the facility. After lunch the group departed MAF for the Mississippi Test Facility. ✓

B 9/25

9/22/69
1. OAo-FOLLOWON PRESENTATION: Dixon Ashworth (OSSA), Jim Kupperian (GSFC), and Joe Purcell (GSFC) expressed again their appreciation for your interest in their presentation on 9/16. I believe that our joint discussion was an important step toward the closing of the gap between manned and unmanned astronomy, and it brought us a potent customer for the shuttle. In fact, the shuttle in combination with OAo-derivatives would remove many of the severe difficulties which orbital servicing and repair would encounter if done by EVA, station attachment, or module pressurization. These difficulties have caused some members of OSSA and the AMB in the past to envision the role of man in space astronomy with reluctance and doubt.

OSSA management, Dr. Newell, and Dr. Paine have shown positive interest in the OAo-Followon proposal. I would strongly recommend that we retain close contact with the OAo program and project managers at OSSA and GSFC, and that we offer active participation in further planning studies of the OAo-Followon proposal.

2. RECOMMENDATION OF 3 METER (120") TELESCOPE PROJECT: The Optical Panel of the Astronomy Missions Board (AMB), chaired by Lyman Spitzer, has now formally recommended that the AMB include in its proposed astronomy projects the launching of two 3 meter (120") telescopes, the first with relatively modest optical and mechanical accuracy, the second with an accuracy approaching the diffraction limit (0.03 arc sec for green light). The Panel also recommended that the employment of man in the deployment, activation, operation, maintenance, and repair of these telescopes should be given fullest consideration.

3. PLANETARY PROJECT STUDIES: At the recent Astronomy Missions Board Meeting, Don Heath emphasized OSSA's great interest in MSFC's planetary mission studies, and suggested that I meet with Bob Kraemer for further discussions. Last week I visited Bob in Washington. He expressed Dr. Naugle's very positive reaction to MSFC's Outer Planets presentation on 8/21. He recommended that we should concentrate on Titan III D with 5-segmented solid booster for the 1974 mission, and that we omit Saturn V versions from our formal proposal (Saturn V projects would far exceed OSSA funding capabilities). Bob also stated that OSSA is greatly interested in high-data-rate reconnaissance flights to Mars and to Venus, and that the possible use of electric propulsion systems for such flights looks very attractive and promising. Funded project studies for post-Viking high-data-rate flights are expected to begin in FY 1972.

Sept. 29 1969



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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ROUTING SLIP

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		See Me
		Signature
		Circulate and Destroy

DIR
 Dr. von Braun
 Direct
 9/10/29
 11-3
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 S. file

With reference to your question on the H-1 Engine/Thor application in the 9/29/69 Notes, we agree that there seems to be very little savings. There is no point in expending some \$12 million of H-1 hardware without showing a significant percentage return. We consider the issue closed as per the attached memorandum. ✓

Bill Brown

cc:

PM-DIR, Mr. Shepherd



NAME	TEL. NO. (or code) & EXT.
William D. Brown	453-0509
CODE (or other designation)	DATE
PM-EP-MGR	10/24/69



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GEORGE C. MARSHALL SPACE FLIGHT CENTER
MARSHALL SPACE FLIGHT CENTER, ALABAMA 35812

October 23, 1969

REPLY TO
ATTN OF:

PM-EP-F/H

TO Memo for Record

FROM F-1/H-1 Engine Project

SUBJECT H-1 Engine/Thor Vehicle Application

We have been actively pursuing all avenues to determine if residual H-1 engines and hardware could be used to advantage in other NASA or Air Force Programs since redirection of the Saturn IB Program in 1968. In response to a query from Goddard Space Flight Center in June 1969, we indicated we could make 39 H-1 engines available to them for the Thor Delta Program. They contracted with McDonald Douglas (MDC) to study the H-1/Thor application, and funded us to manage the Rocketdyne portion of the study.

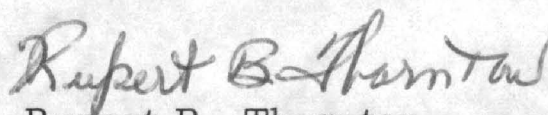
These studies show the concept to be technically feasible, however, the practical and economical aspects of such a modification are disappointing. It appears that we could realistically save approximately half the cost of new Thor engines (8-9 million) but this would be generally offset by MDC's vehicle modification costs. There are other factors which impact the final decision that we at MSFC are not in a position to evaluate, such as:

1. Increase or decrease in field service and logistics support costs
2. Effect on the Air Force Thor Program
3. Effect on flight performance predictions
4. Reduction of strap-on solid motors due to the higher thrust of the H-1 engines
5. The effect of such a major modification on vehicle reliability

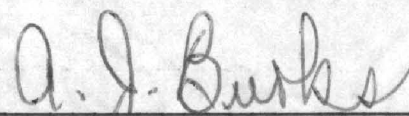
GSFC may feel that a change of this magnitude should be qualified by static testing some of the first vehicles modified, and/or flying one or more R&D vehicles.

GSFC did not react positively to the MDC/Rocketdyne study, and has not provided the occasion for us to pursue this subject with them in depth. In a telephone conversation on October 21, 1969, they indicated that the study will be presented to NASA Headquarters for a decision in the near future. A rejection is expected as implementation would cause an increase of approximately \$7 million in their FY-71 budget to fund the MDC modification.

Effort appropriately conducted by MSFC has been completed. Since substantial savings cannot be demonstrated, and the risks to the Thor system are considerable, this investigation has been terminated at MSFC.


Rupert B. Thornton

CONCURRENCE:


for F. M. Stewart, Mgr.
F-1/H-1 Engine Project

cc:

DIR, Dr. von Braun
PM-DIR, Mr. James
PM-EP-MGR, Mr. Brown
PM-EP-J, Mr. Smith
PM-EP-F/HC, Mr. Seiser
PM-CO-E, Mr. Burton
S&E-ASTN-T, Mr. Grafton
MAT, Mr. Kistle
GSFC, Mr. Bourdeau
GSFC, Mr. Gunn

NOTES 9/29/69 BALCH

B 10/2

S-IC-12 - Stage processing is running approximately 5 days behind schedule. The stage contractor is formulating a recovery plan to prevent impact to the propellant load test scheduled for 10/15/69 and 10/16/69 and static firing scheduled for 10/22/69. ✓

S-II-9 - Stage is in the vertical position in the Stage Checkout and Storage Building with insulation modifications completed. ✓

S-II-10 - Stage Contractor has rescheduled static firing from 9/25/69 to 10/1/69. The delay was caused by a requirement to pressure test and leak check the LH₂ tank pressurization line. A leak had been discovered in the LH₂ tank pressurization line on the S-II-12 stage, and it was necessary to determine whether there was a similar leak on the S-II-10 stage. Testing of the line on the S-II-10 stage has now been completed, and the results are satisfactory. ✓

S-II-11 - "Power-up" was rescheduled from Friday, 9/26/69, to Monday, 9/29/69, but this is not expected to impact the cryogenic proof pressure test or static firing, which remain scheduled for 10/18/69 and 10/29/69, respectively. ✓

Valve Testing at MTF for KSC by Chrysler - This project is now under way at the Components Test Facility and is progressing satisfactorily. Chrysler Corporation personnel performed 3 test runs on 9/24/69. ✓

GE Service Contract - Amendment No. 188, which provides for continuation of general support services at MTF for an additional 3 months from 10/1/69 through 12/31/69, has been signed by the contractor and transmitted to MSFC for approval. The total amount for the additional three months is \$5,096,900.00, which includes \$81,000.00 Base Fee and \$378,500.00 Award Fee. ✓

Dr. von Braun

NOTES 9/29/69 BELEW

9/29/69

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1. B KSC ACCEPTANCE TEST PLAN MEETING: MSFC participated in a meeting at KSC, September 23-24, 1969, to discuss the AAP Module Factory Acceptance Test Plans and KSC's plans for prelaunch checkout. Each Module Project Office presented the Acceptance Test Plans and a brief description of the wet to dry configuration changes. KSC presented a proposed plan for prelaunch checkout assuming an OWS side entrance door and interior floor changes to allow one-G entry and operation without extensive GSE in the VAB. KSC also had a contingency plan utilizing the Manned Spacecraft Operations Building (MSOB) if the above OWS changes were not approved. A followup meeting will be held very soon to determine the final approach for these tests. ✓

CLUSTER RECLOCKING: Action has been taken to get a cost estimate impact from MDAC-ED if the MDA/ATM/DA is rotated 90° counter-clockwise to simplify the ATM film retrieval/EVA design task. The impact is anticipated to be a minor radiator design change and major mole seive relocation change. ✓

MATERIALS AND PROCESS TEST: Emissivity tests of the configuration involving the application of gold tape to the exterior of the LH₂ tank, and sprayed teflon on the interior of the meteoroid shield have been completed. Upon final data confirmation by S&E (ASTN), it is planned to use this configuration on OWS #1. ✓

ROUTING OF PROCUREMENT ACTIONS: Ref: Notes 9/22/69 Siebel Discussions with S&E have indicated that the one "held for funds" procurement was an exception by encountering "front office" delays and this holdup could have been eliminated or reduced by notification of a S&E Bio-Astronautics Task Team member or the medical experiment monitor in this office. Both organizations have already taken steps to handle similar cases in an expeditious manner in the future. (Copy of Siebel Notes attached) ✓

JF 9/29

B 10/2

Wilson/Gould Oversight Committee Staff Study - "Future Manned Space Flight Effort and Launch Rate" will be the subject for the annual House Oversight Subcommittee Staff Study by Jim Wilson and Harold Gould. ✓

Wilson and Gould will meet with Freitag's people on Monday, September 29 to finalize study plans, but a tentative schedule shows Wilson and Gould at Headquarters on October 15-17, MSFC on October 20, Michoud and MTF on October 21 and 22, followed by visits to MSC, Grumman, MDC and NAR with the final visit to KSC on November 17. ✓

Wilson and Gould will study the effect of various launch rates on personnel levels, skill mix, utilization of plant and equipment, and level of sustaining effort required to maintain an effective program team. The study will also evaluate the effect of various levels of effort on future program requirements. Rationale and conclusions will be available for Committee use during the FY-71 Authorization Hearings. ✓

The program cost study, proposed earlier by the Committee Staff, will not be made, but summary data on that subject will be provided to Mr. Wilson by George Vecchietti of NASA Headquarters. ✓

Revised EOY FY-70 Civil Service Ceilings - We were informed by Dr. Mueller's letter of September 18 that Marshall's FY-70 end of year target ceiling for permanent Civil Service personnel is now 5969. A comparison of the revised ceilings for each MSF Center with the previous budget book ceiling is shown below:

	<u>Previous Budget Book Ceiling</u>	<u>Δ</u>	<u>Revised Ceiling</u>
MSFC	5851	+118 ✓	5969
MSC	4303	-104	4199
KSC	2881	-115	2766
TOTAL	13035	-101	12934 ✓

MSF Review of Center POP 69-2C - Eighteen people from MSF will be at Marshall on October 2-3 to review our R&D and R&PM POP submissions in detail. The morning of October 2 will be used for formal R&D program presentations with the afternoon utilized for individual program working sessions. If required, R&D working sessions will continue on October 3. The afternoon of October 2 will also be utilized for the R&PM review. ✓

NOTES 9-29-69 BROWN

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9/29/69.

F-1 Engine - During leak check of the LOX sequence valve cap on AS-508, engine F-6058, the ignition monitor valve malfunctioned. The failure was indicated when the main fuel valves opened on engine start command with no pressure applied to the IMV control port. The failed unit was removed and replaced and returned to Canoga Park for failure analysis. X-rays showed the diaphragm in the IMV had ballooned and that gas was trapped between layers. Investigation of failure mode and inspection of other engines is continuing. No schedule impact is anticipated. ✓

H-1 Engine - As you may recall, in response to a query from GSFC we had indicated that we could make 39 H-1 engines available to them for the Thor program. Subsequently, they funded a special study with Rocketdyne and McDonnell-Douglas to determine the feasibility of using these engines in the Thor vehicles. The results of the GSFC study were presented on September 11. The study showed the concept to be technically feasible. Combined contractor cost was estimated to be \$17,742,000 for vehicle adaptations for the 39 engines. This would result in a net savings of \$258,000 over buying new engines for the Thor. ✓ BB Any refund to MSFC? B

not very
much,
I'd say.
B

J-2 Engine - Reference my notes of 9-22-69 concerning similarity between the torsional bellows leakage discovered during leak checks on the S-II-12 LOX feed line on 9-11-69 and the J-2 engine fuel inlet duct on S-IVB-508 in April 1969. The J-2 engine inlet ducts on S-IVB 507 have been leak checked and the LOX duct was found to have a small leak (1.2×10^{-2} sccs helium). It was removed and replaced by a spare. The removed duct is being returned to Rocketdyne for analysis. All stage feed lines and engine inlet ducts containing the torsional bellows will be leak tested again between CDDT and launch. The J-2 engine ducts are manufactured by Rocketdyne and not by Solar as reported in the 9-22-69 notes. ✓

Engine Flight Readiness Assessment for AS-507 - On 9-23-69, the Engine Flight Readiness Assessment for Vehicle AS-507 was held at Rocketdyne, Canoga Park, California. Both the F-1 and the J-2 engine status were reviewed. The meeting resulted in determination that no problems exist other than those discussed above and the engines are considered ready for flight. ✓

B 9/25

9/15/72
J-2 ENGINE: (Bellows Leakage Problem - Comparison of S-II-12 LOX Feed Line and J-2 Fuel Inlet Duct on S-IVB-508:)

A leak was discovered in the S-II-12 center engine LOX feed line on September 11, 1969 during post manufacturing leak check. The leak was traced to the torsional relief bellows section where approximately 32 pin hole leak paths were eventually identified. Cause of the pin holes appeared to be external corrosion such as might be caused by an acid or caustic solution. Improper cleaning during manufacturing is suspected. The bellows itself was identified as having been fabricated by a firm named Gardner which also supplies similar torsional relief bellows to Solar for fabrication of the J-2 engine fuel/LOX inlet duct bellows. ✓

A similar leakage problem had been previously discovered in April 1969 on the J-2 Engine Fuel Inlet Duct on S-IVB-508. Rocketdyne removed the duct and found corrosion and one pin hole leak. Ten other engine inlet ducts were selected at random for inspection and no leakage paths or significant corrosion were found. Therefore, the matter was presented as an isolated failure in the AS-505 Program Manager's Readiness Review and was closed out at that time. In light of the S-II-12 duct leak, the Rocketdyne Duct Investigation has been reopened. ✓

The following information is available for comparing the two ducts. Both ducts use a Torsion Relief Bellows of very similar design where the corrosion and resulting pin hole leaks were found. Both ducts are fabricated by Solar, however, the torsion relief bellows for the two leaking ducts were fabricated by different vendors, Gardner for the S-II and Fairchild for the J-2 Engine Duct on S-IVB-508.

As a result of the discovery of the above leaks, it was decided to inspect all S-II Stage and S-IVB Stage LOX and Fuel Ducts of similar configuration including all the J-2 Engine Ducts. S-II-7 and S-II-8 have completed inspection and there are no leaks. S-IVB-507 is to be inspected next. The S-1C stage and F-1 Engine Offices are surveying their systems to ascertain if they have any similar feed lines. ✓

Rocketdyne and Space Division are working together to find the cause of the problem; a manufacturing procedural problem such as improper cleaning or passivation is suspected. The problem is to be reviewed further in AS-507 J-2 Engine and S-II Stage Preliminary Readiness Reviews this week. ✓

A special team from MSFC laboratories will be traveling to Seal Beach this week also to take part in the investigations. ✓

- 9/29/29
1. BIOSCIENCES PLANNING: Since the visit of Dr. Naugle and the OSSA Program Directors to MSFC on August 21, Dr. Hilchey and others have been working actively with the Biosciences Program Office staff in OSSA in planning a bioscience payload definition study for the Space Station and for the SWS II mission. This planning activity has involved a three-way coordination between MSFC, OSSA, and ARC. OSSA appears very anxious to initiate an appropriate definition study or studies, but funding availability in FY-70 for them is not assured. ✓
 2. HIGH ENERGY ASTRONOMY OBSERVATORY: This definition effort is continuing, and the present activity involves completing the in-house Phase A technical work and preparing the plans and documentation to permit letting the Phase B contracts, hopefully by April of next year. Present plans are for awarding two parallel competitive contracts during Phase B, since we believe it is highly desirable to maintain competition during Phase B. OSSA has not yet released the Announcement for Flight Opportunities Document to the scientific community. This delay concerns me, since the experiment development will almost certainly be the pacing element for the first mission. ✓
 3. ASTRONOMY PLANNING: I would like to express my generally favorable reaction to Mr. Purcell's OAO Follow-on Presentation. I was pleased to observe that as a result of the AMB's encouragement, and with the passage of time, the GSFC position regarding manned servicing, repair, and experiment updating has shifted significantly. Preliminary conceptual illustrations have been prepared of OAO follow-on spacecraft being serviced by the Space Shuttle and Space Tug. They have been sent to Mr. Purcell for comment. Mr. Mitchell informs me that Dr. Naugle showed Dr. Paine artist concepts of various future telescope systems in the Shuttle. ✓
 4. RELATIONSHIP BETWEEN OAO AND HEAO: OSSA's present planning visualizes two spacecraft for major future stellar astronomy payloads. These spacecraft are the High Energy Astronomy Observatory, which will evolve to provide a capability for the high energy experiments requiring coarse pointing (1 arc min), and the OAO Follow-on series to provide capabilities for optical telescope payloads requiring fine pointing (.01 - .1 arc sec). I have been informed that the AMB considers that the development of the HEAO for the high energy missions is of an even higher priority than the extension of the OAO capability as described by Mr. Purcell. I hope that an "either/or" situation does not develop, and that the HEAO and OAO Follow-on in association with the Shuttle and Space Station programs will both materialize. ✓
 5. GULF STREAM DRIFT MISSION: At the request of Public Affairs, Chet May taped a television interview on the Gulf Stream Drift Mission. This tape was shown on local Educational TV (Channel 25) on September 23 and 25. ✓
 5. OSSA NEW STARTS: During my visit to OSSA last week, Mr. Mitchell informed me that by the end of this week we should have a reasonably firm indication of the new hardware starts which OSSA will pursue in FY-71. ✓

B 10/2

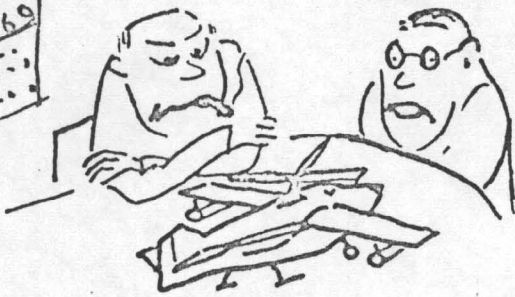
7/9/29

1. CONTAMINATION: Mr. J. D. Johnson, S&E-AERO-AA, visited MTF recently to discuss work that is being performed there on a task entitled "Investigation of the Characteristics of Fluids that are Vented into a Vacuum." This task is being performed on a grant to Louisiana State University entitled, "Special Support of Saturn/Apollo Utilizing Mississippi Test Facilities." This task is primarily concerned with experiments in which water is expelled through a small orifice (0.02 or 0.03 inch diameter) into a vacuum chamber (chamber pressures go down to 10^{-5} Torr). These experiments have shown that the expelled water rapidly freezes and two things can happen when the ice particles impinge on a cold surface. (1) Icicles form on the surface or (2) ice particles ricochet from the surface. For practical space station applications, this ricocheting phenomena indicates that expelled water could cause ice particles to surround a space station if expelled water impinges on an external surface of the space station.
2. S-IVB/IU LUNAR IMPACT: Original planning for the flight program for the AS-507 "H" mission included a slingshot maneuver for the S-IVB/IU configuration. However, those values which were incorporated into the flight program will cause a lunar impact. This change is caused by the uncertainty when Time Base 8* will begin and when the LH_2 nonpropulsive vents are to come on. This information has been presented to PM-SAT and we are waiting for a decision on which one of two probable actions will be taken, (1) impact the moon or (2) turn on the APS thrusters for an additional 100-150 seconds by a real time command.
A meeting was held at MSC on September 23, 1969, to discuss the procedures for executing a lunar impact on AS-508. All of the concerned groups (Flight Controller, PM-MO, and AERO) were represented. The major agreements are: (a) MSFC will be the source for definition of the real time maneuvers. (b) MSC will furnish us the necessary telemetered data. (c) MSC will be the source for tracking vectors and tracking data all the way to impact.
3. GROUND WINDS RESEARCH PROJECT CHOSEN FOR TELEVISION PROGRAM: The study of impulsively started flows around cylinders and their resulting unsteady fluctuating pressures and loads is being conducted at the University of Alabama at Huntsville Center by our Unsteady Gas Dyn. Br. The intent of the study is to attempt to understand the basic fluid physics phenomena associated with the above types of flow fields by developing and utilizing a unique but simple experimental apparatus. The initial phase of this study was the analytical analyses, design and fabrication of the impulsive flow facility. This project was chosen to represent typical research work being done at the University for presentation on "Educational Television." A half-hour program was shown at 7:30 p.m. Tuesday, September 16 and Thursday, September 18, 1969. The T.V. program featured Dr. Cornelius Shih, University of Alabama supervisor of the research work, Mr. L. Schutzenhofer, from our Laboratory and Mr. Morrow, both University of Alabama graduate students working on the project. (The presentation was essentially along the same lines as given to Dr. Kurzweg (OART Hqs.) when he last visited MSFC.) The Saturn V ground winds problem was emphasized and more than adequate recognition was given to NASA.
4. EVALUATION OF MSC SPACE SHUTTLE CONCEPT: Attached is an artist's conception, picked up at the Flight Research Center illustrating the probable evolution of the MSC Space Shuttle Concept.

*Time Base 8 (initiated by ground command after CSM/LM extration and evasive maneuver attitude is attained - This is a variable time and will not occur until the crew has verified safe separation.)

SEP 26 1969

NASA
1969



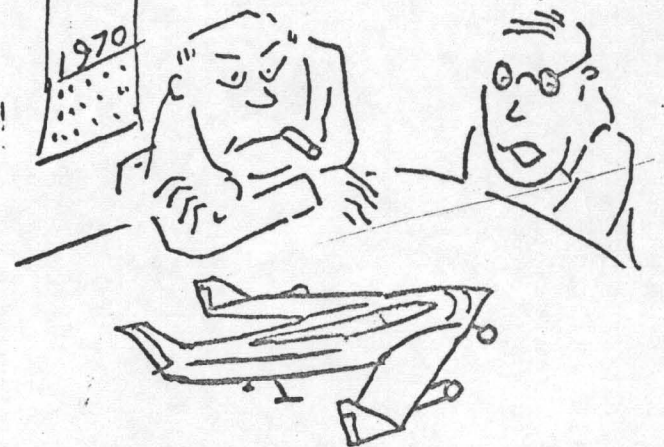
This shuttlecraft will do every thing according to our Paper Study.

NASA
1971



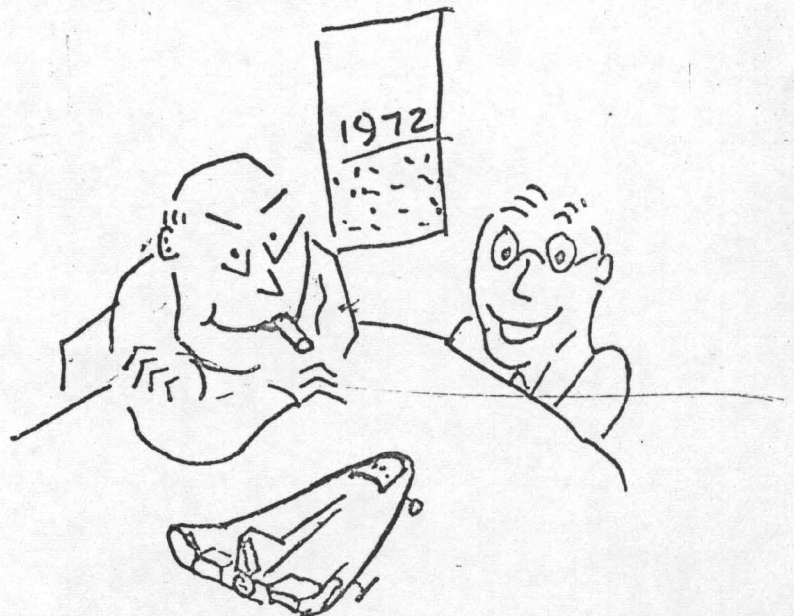
More detailed studies indicate this shuttlecraft can do most of the Mission.

NASA
1970



Preliminary wind tunnel studies indicate this shuttlecraft may do every thing.

1972



After exhaustive studies we have found the shuttlecraft to perform the mission.

SATURN:

NOTES 9/29/69 GODFREY

B 10/2

27/9/23

1. AS-506 Cross Range (Y) Velocity Error: Refer to Brooks Moore's Notes of 9/15/69 and your question "Did PM buy this recommendation?" PM strongly supported this recommendation and pressed for early definition and implementation on AS-507. Unfortunately, the ECR defining the measurement change was not available until Oct. 11. IBM was immediately authorized to prepare mod kits, but a three-day impact to 507 FRT will delay the change until 508. ✓

2. Corrosion of Engine Feedline Bellows: A comparison of the processes used by SD and Rocketdyne during the subassembly and assembly of the torsional bellows has to date not revealed the corrosion source. There is evidence to indicate that several processes can be improved to arrest the corrosion but with the bellows configuration being very difficult to clean and dry, no clear-cut solution has been established to guarantee elimination of the corrosion. Material changes, redesign, and process changes are all being considered to ultimately eliminate this problem. Oct. 8, 1969 is the target date to review with MSFC the contractor's recommendations on what action must be taken to correct the problem on later stages. The bellows on S-II-7 and S-IVB-7 have been leak checked to assure that any degree of corrosion present has not resulted in leakage. The S-IVB LOX engine bellows leaked and was replaced Sep 25, 1969. This bellows is presently being dissected and analyzed by Rocketdyne and MSFC. The S-II-7 engine and stage bellows did not have any leakage. We plan another leak check after CDDT on the S-II and S-IVB stages to clear the bellows for launch. No impact is anticipated on 507 due to this problem unless we find bellows that leak and will have to be replaced. NR, Rocketdyne and MDAC reported last week that the corrosion experienced to date has been individual pitting at small holes, and does not appear to significantly reduce the bellows strength.

Leakage of the bellows will be monitored by the interstage leak detection systems, and any leakage after liftoff would be expected to be too small to cause a problem. ✓

LRV:

TRW presentation on LUNAGEM: Reference your question on my notes of 9/8/69, concerning specific actions recommended on the LUNAGEM, the following comments are offered: The LUNAGEM would appear to offer enough potential for lunar surface exploration to make it worthwhile to continue studies and technology development on this, along with advanced roving vehicles and flyers. ✓ Our comments were related to the LUNAGEM directly replacing the state-of-the-art Manned Rover now under procurement action by PM-SAT. We strongly support continued study of Rover configurations such as the LUNAGEM and Loop Belt vehicle by Program Development and are working closely with Rod Stewart. ✓

9/29/69

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AEROSPACE PRESENTATION TO DR. MUELLER

In response to a request from MSF, Mr. O. C. Jean, PD-RV, and Mr. R. D. Scott, PD-DO-P, were sent as MSFC's representatives to the Aerospace Corporation presentation to Dr. Mueller on September 22. The four-hour presentation related directly to the September Management Council Meeting action items on the Space Shuttle and was structured to emphasize Aerospace Corporation's quick-response capability and, at the same time, to add further comment concerning some of the decisions made at the Management Council Meeting, e.g., achievement of the DOD requirement for cross-range and the implications of the 400K thrust engine. Specific items of discussion were the reusable Orbit-to-Orbit Shuttle (Space Tug), Space Shuttle performance analysis and engine sizing, and the Space Shuttle thermal protection system.

The Space Tug presentation emphasized its importance to the enhancement of the Space Shuttle system operational flexibility and pointed out the advantage of maintaining the Space Shuttle payload capability at the larger 50K size.

The Space Shuttle performance analyses paralleled our in-house calculations for the 3.5-million-pound gross lift-off weight configuration, resulting in an approximate 20K-30K payload, and emphasizing the structure factor sensitivity.

The engine sizing presentation was similar to our own September Management Council presentation and concluded with the recommendation to develop an engine in the 700-800K thrust size for both booster and orbiter elements. Dr. Mueller's response was, "Amazing that you should draw this conclusion from the data presented -- my conclusion would be smaller thrust size and more units." Little doubt was left as to his preference for the 400K engine.

The thermal protection system presentation indicated the need for refinement of temperature prediction techniques and the requirement for materials development for all of the proposed configurations. Judicious selection of the orbiter configuration (L/D) could make possible increased cross-range capability when improved thermal protection systems are developed.

Dr. Mueller appeared impressed with the quantity of material generated in such a short period of time (Aerospace quoted 4 days) and requested continuation of the effort. He further emphasized the need for continued assessment of the validity of contractor configuration data and the separation of design/configuration peculiar items from contractor optimism or pessimism, whichever the case.

I'm
amazed,
too, but
in a
different
sense!
B

8F9/29

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1. QUALITY PROGRAM REQUIREMENTS: This Laboratory agrees with Roy Godfrey's conclusion in his note of 9-8-69 (copy attached) that requirements should be identified at the beginning of the program and priced at that time. As Roy Godfrey and I discussed, this requires the full support of Program Management, who has to insist that the Q&RA program plan be submitted and properly evaluated prior to finalization of the contract. This should be less difficult now, under the phase A, B, C, D approach, than it was years ago when in order to buy time for money, the contract was let with the definition of the work to be accomplished thereafter. The present more organized approach makes possible reductions in requirements "for prior approval by the Government" and for documentation. This is already reflected in the NHB 5300.4 (1B) publication entitled "Quality Program Provisions for Aeronautical and Space Systems Contractors" which in the revised version of the document NPC 200-2 of April 1962, and is just being distributed.

As far as the follow-on contract is concerned I know that Roy Godfrey will support valid requirements and will not allow compromising them due to unreasonable contractor cost estimates, and this Laboratory will assist him in this respect to the utmost. If this necessitates the removal of some of the remaining requirements "for prior Government approval" this will be considered as I agreed with Roy Godfrey. The phrase, "for prior Government approval", should not present a problem since vehicle 515 is supposed to be the baseline and no changes should occur hereafter. If, however, substantial changes are already being planned by some contractors and will be revealed only after the contract is signed we better be protected by some phrases which permit us to keep our finger on the pulse.

The key to getting the contractors behind an excellent quality program is, I believe, the application of contractual motivation methods such as appeared in the recently reported case of the Pratt Whitney jet engines.

ATTACHMENT: NOTES 9/8/69 GODFREY (Dr. von Braun's and Mr. Weidner's copies only)

B 10/2

9/29/69

KSC AAP Test Meeting: The meeting was held September 23 in the KSC Headquarters Building. MSFC (Program Management) presented a synopsis of the currently defined module test flows. MSC presented the CSM test flows for the AAP 2, 3, 4 vehicles and their requirements for docking tests and astronaut participation. As in past discussions, the astronaut participation requirements will not be defined in detail until the module flows are determined and these then will be impacted by MSC to meet their crew requirements. MSC's reasons for crew participation were for orientation and familiarization because the trainers and simulators were not satisfying this requirement. There are three primary crews, three primary backup crews and three secondary backup crews for a total of 27 men. ✓

NOTES 9-29-69 HEIMBURG

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1. LIQUID HYDROGEN TANK PRESSURANT LINE: During a systems checkout test of S-II-12, a leak was discovered in the upper segment of the liquid hydrogen tank pressurant line at Station 837. The line was removed and shipped to Solar for inspection. Penetrant and X-ray inspections revealed 6 cracks in the weldment and adjacent heat affected zone where the inconel 718 tube welds to the 321 stainless steel end flange. Only one of these defects is a through crack. Of the other five, three were detected by X-ray inspection and penetrant revealed the other two. X-ray film of the weldment taken during manufacturing of the line has been checked but no out-of-specification defect is visible. Since other lines also contain cracks not identified by the Solar inspection, it appears that the inspection is faulty. The defective S-II-12 line segment has been returned to Solar for an additional proof test since no crack free lines are available. The line has a design safety factor of better than 3. Apparently, previous vehicles have flown with cracked lines.
2. S-IC-8 EXTRA O-RING: During an inspection to determine the cause of a gap in the servo-actuator high pressure hydraulic line to engine position 102, an extra O-ring was found between connecting flanges. A similar discrepancy had been found on S-IC-7, had been corrected, and a discrepancy check had been written to check other stages. The discrepancy is apparently caused by leaving a shipping O-ring on the flange when the flight O-ring is installed. The Boeing Company is correcting manufacturing procedures to prevent this problem. It was a similar problem in the TBC processing which caused the S-IC-11 fire.
3. APOLLO FECAL COLLECTOR EXPERIMENT (AFCE): A mockup of the AFCE with high fidelity volume envelope, seat, and restraint systems will be flown on the KC-135 9-30-69. The purpose of these simulations will be to determine whether the stowage locations and restraint systems are adequate for preliminary design. Astronaut McCandless has indicated a desire to participate in the simulation. Considerable effort was expended to provide a package of information on the AFCE to Mr. Simmons, PM-AA, 9-16-69. This information was to be used in a discussion with Mr. Schneider, NASA Headquarters, 9-17 or 18, 1969. The discussion did not occur and a memo is to be sent from Mr. Belew to Mr. Schneider with the information enclosed. It is imperative that approval for this experiment be obtained from the Apollo Change Control Board before Apollo 12 activity becomes too intense to permit an audience.
4. BIOMEDICAL: We have been requested by the Technical Utilization Office to help resolve a problem with some cardiac diagnostics apparatus at University Hospital in Birmingham. We propose to assist them on a non-interference basis.

NOTES 9-29-69 Heller

9/29/69

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LUNAR SCIENTIFIC EXPERIMENTS: OSSA has announced a flight opportunity for experiments on Apollo flights 16-20. Bob Jones, whom I recently appointed as the SSL focal point, represented the intended SSL proposals at a pre-proposal meeting on September 24 in OSSA. Ten of our SSL scientists intend to submit a proposal. I consider this a good opportunity for our scientists to become PI's or co-investigators on a team of PI's. In most cases the proposals are based on existing experiment breadboards or prototypes such as the drill, radiometer or gravimeter. At this time we are preparing ourselves to enter the scientific competition or team up with those scientists who have a high standing in lunar science exploration. We would like to give you a briefing on the proposed scientific program and hope to get some guidance about this program.

o.k. please arrange with Bonnie

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1. INSTALLATION OF RSIC TERMINAL: In November 1969, a Bunker Ramo terminal station is scheduled to be installed in the Redstone Scientific Information Center (RSIC) as a part of the NASA Headquarters' Remote Console (RECON) System. This terminal will provide a direct tie-in between Marshall and a NASA Headquarters' information center located at College Park, Maryland.

This terminal will replace the NASA Search System presently being run for RSIC on the Marshall IBM 7010 computer utilizing an average of 20 hours per month. In addition, requirement for converting this system to the UNIVAC 1108 should be eliminated. ✓

The function of this terminal will be to allow information retrieval by library patrons directly from master files maintained for every published document by NASA Headquarters. Retrieval may be performed on numerous elements including: author, title, subject terms, Library of Congress number, etc., with the results displayed on a cathode ray tube. ✓

If a hard copy is required after review, it can be made at that time. ✓

This terminal will be purchased by Marshall at a cost of \$12,500 with all other costs assumed by NASA Headquarters (under the MSFC/MICOM agreement, one-half the cost will be assumed by MICOM). ✓

2. SPACE STATION PROGRAM DEFINITIONS DOCUMENT: Computation Laboratory Data Center Division personnel are working with MSFC and MSC Space Station Task Teams, and with MSC Computation and Analysis Division personnel, in coordinating and planning the continued production of a "Guidelines and Constraints Document" to provide Space Station Program Definitions.

MSFC's present efforts to produce the "Guidelines and Constraints Document" are directed toward utilization of MSC's text editor program for the IBM 1130 computer, along with consultation with their data processing personnel. We feel that this will lead to the creation of a similar back-up capability at MSFC to produce this document. ✓

MSFC's present utilization of the MSC program, computer, and personnel provides lead time for planning efficient back-up production capability at MSFC to produce the "Guidelines and Constraints Document." ✓

B. 10/2

9/29/69

1. MANNED PLANETARY STUDIES: We have been contacted by Doug Lord's Office regarding initiation of an inter-Center, in-house manned planetary study (seemingly similar to the Space Station and Manned Planetary "JAG" studies of a few years ago). A letter to you has been prepared for Dr. Mueller's signature, requesting MSFC participation in the study group. If signed by Dr. Mueller, the letter should be received at MSFC within a week. We will need to consider this activity carefully, with respect to mission requirements and module compatibility studies currently in progress as a part of the MDAC Space Station study contract. ✓

2. NERVA ENGINE AND NUCLEAR SHUTTLE ACTIVITIES: We have been informed that SNPO is preparing a set of guidelines which, if implemented with Aerojet, would reorient the NERVA program to an engine compatible with Nuclear Shuttle requirements. ✓ Implementation of the guidelines is subject to Dr. Paine's approval of the Nuclear Shuttle, and a firm decision to reorient the NERVA program. SNPO will propose a topping cycle design, with a ten-hour engine lifetime, holding a nominal specific impulse of 825 seconds. ✓ As reported previously, we already have discussions underway to orient at least a portion of the current Nuclear Stage Definition studies, to concentrate on the reusable shuttle concept. OART/SNPO has proposed to Dr. Newell an early study of Nuclear Shuttle operations and requirements, under contract with the Aerospace Corporation. At last reading, the status of this proposal was somewhat uncertain, in view of a rumored larger study contract with Aerospace Corporation, to examine and further define the Integrated Space Program. ✓

9/29/69 NOTES HUETER

No submission this week.

9/29/29

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NOTES 9/29/69 JOHNSON

8/29/29

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Research Achievements Review - The ninth of the third series of Research Achievements Reviews was held on Thursday morning, September 25, in the Morris Auditorium. Presented by the Computation Laboratory, it covered progress in Computation Research since May 1967. ✓

OMSF Advanced Systems Development Program - Some progress has been made in negotiating approval of this program with Headquarters. All space station RTOP resumes now have been given technical approval by OART and funds have been released. The content of the work package in the shuttle propulsion area was negotiated task by task and is now approved and funding released. We dropped our program of in-house work in support of the main propulsion system in favor of two pairs of parallel contracted studies to establish Auxiliary Propulsion System requirements and system layout and initiate engine breadboarding activities. Only that shuttle work in technical disciplines normally under the purview of the Space Vehicle Programs Division (Milton Ames) in OART remains to be decided. We are currently in the process of formulating descriptions of proposed individual tasks for review by OART Headquarters and Tischler Committee -- principally Langley -- personnel in these discipline areas (materials, structures, dynamic analysis, thermal, and aerodynamics). It now appears that this task by task selection process will pretty well wipe out support for the aerothermodynamics program originally submitted by the Center in support of the Shuttle. It also appears that the compromises which will be required to get approval of some of the tasks planned by the Center in structures and materials will destroy any remaining coherence of program in these areas. The principal advantages of proceeding this way are that we are proceeding (albeit, slowly) and that the wisdom of the responsible laboratories in planning their work is replaced by the composite wisdom of one or more committees. ✓

Lucas

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9/29/69

NOTES 9-29-69 ADVANCED PROJECTS (PD)

1. AEROSPACE CONTRACT: A memo of agreement has been signed between NASA (Mueller) and the Air Force (Phillips) which results in Aerospace technical effort for 100 to 120 people for one year. Funding for this contract comes from NASA (\$2M), Air Force (\$2M), and Aerospace (\$1M). The subjects to be studied under this contract are:

Orbital-to-Orbital Shuttle (Chemical, Orbital-to-Orbital Shuttle (Nuclear), The Space Tug, Earth-to-Orbital Shuttle, DOD uses of the NASA Space Station, Advanced Mission Operations Concepts, Subsystem Analyses, Cost Factors and Sensitivity, and A Module Commonality Assessment. The Air Force will direct this effort, and NASA will interface with the Air Force. ✓

2. SPACE SHUTTLE THERMAL PROTECTION: The Aerospace Company made a presentation to Dr. Mueller last week on thermal protection systems for the shuttle and showed that material development is required for all configurations. Their studies indicate that the thermal environment is less for a high L/D vehicle flying a high angle of attack ($\approx 60^\circ$) than a low L/D vehicle flying the same angle of attack. This leads to the conclusion that the basic body shape should have high L/D capabilities but in the first flights, before the ultimate thermal protection system is developed, fly high angle of attack to keep the heating environment within the present material state-of-the-art. ✓

How come?
B

3. LUNAR EXPLORATION HARDWARE PLANNING: We have been asked by the Lunar Exploration Office in Headquarters to suggest technology and hardware programs which would support the development of payloads for Apollo Missions 21 - 28. Preliminary information will be available by Thursday of this week which will support an integrated Lunar Exploration Hardware Program. ✓

4. ARTIFICIAL GRAVITY EXPERIMENT FOR AAP: A presentation to Chuck Mathews on this subject is now scheduled for 10-17-69 (postponed from 9-30-69 at our request). MSFC has been asked to report on configurations and DWS systems impact; MSC, likewise, on experiment requirements. We will schedule the appropriate staffing of this presentation at MSFC prior to presentation to Headquarters. ✓

NOTES 9/29/69 MOHLERE

9/29/69

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Nothing of significance.

NOTES 9/29/69 MOORE

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9/29/69

1. SPACE SHUTTLE INTEGRATED ELECTRONICS TECHNOLOGY PLAN: With Dr. Mrazek's encouragement, Astrionics is participating heavily in the activities of the Space Shuttle Integrated Electronics Working Group for Mr. Tischler at OART who is charged with generating a Technology Plan to support the Shuttle. Mr. Bob Wedan, of Electronic Research Center (ERC) is the chairman for Integrated Electronics Group. Nine of our people participated two weeks ago in a "crash" meeting at ERC to get definition of an electronics technology plan off the ground. The meeting resulted in identification of technology areas in the electronics field, and tasks under each technology area which need to be worked. Mr. Wedan subsequently requested by TWX that NASA centers indicate which task area they are interested in pursuing. S&E responded with vigor and such was expressed in MSFC's reply to Mr. Wedan. The next step, now underway, is to submit more detailed plans covering each task area technically, including costs and schedule. This is being done in RTOP format for submission to ERC the first week of October. ✓

2. SPACE SHUTTLE - INTEGRATED ELECTRONICS AND DATA BUS: We are presently evaluating our level of effort and existing equipment breadboards to determine what changes need to be made to make possible an immediate and expanded effort in Space Shuttle integrated electronics and data bus investigations and development. It should be noted that our personnel have already applied some of the principles of such concepts in Saturn and AAP. For example, through a data bus arrangement with the IU telemetry, the Launch Vehicle Digital Computer (LVDC) is able to address and receive information from many IU electronic subsystems. LVDC control is accomplished by the issuance of a command and address code to the switch selector. Another example is the Saturn V Display System which uses a data bus between an integrated electronic system that includes a digital computer and twenty display and control consoles. This laboratory is involved in a continuing program which is providing refinement and extension of these important concepts. Future programs, such as Space Shuttle, will be the beneficiaries of this effort. ✓

B.M. | 3. SPACE SHUTTLE AVIONICS RESPONSIBILITY ASSIGNMENT: Although I have not been involved in any official discussions on the matter, I am alarmed by persistent rumors which indicate that preliminary agreements are being reached which would result in MSC being assigned the primary responsibility for the Space Shuttle Avionics System development. Rumor has it that the avionics system goes to MSC in exchange for the engine development coming to MSFC. Even if MSFC does have the edge in engine experience, it doesn't necessarily follow that the reverse is true for the avionics system. I can only hope that the rumors are ill-founded and that our capability in the avionics area will be judged on its own merits. ✓ I believe your past policy of accepting only those major projects which involve the total center capability has been a very good one, ✓ and I hope we will continue to adhere to it. ✓ If the Astrionics Laboratory is involved in this major project in a secondary role only, it will be very difficult to work the job enthusiastically. ✓

B.M.

Not so.

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NOTES 9-29-69 SIEBEL

9/29/69

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1. Neutral Buoyancy Simulator: On Wednesday evening, September 24, at about 9:30 p.m., we were notified by TVA that a hard-hat diver in the Knoxville, Tennessee area had symptoms of the bends. TVA inquired about the availability of our hyperbaric chamber. We, obviously, said that we would make the chamber available. The patient was brought in by air and immediately placed in the chamber (midnight Wednesday) for treatment in accordance with the Navy Diving Manual treatment tables. Three complete recompression cycles of treatment were conducted in the chamber. The patient was moved to a local hospital at 1:15 a.m. on Friday. Our chamber crews manned the chamber around the clock and were on standby for 24 hours following the termination of the final treatment. Both TVA and MSFC doctors were in attendance throughout the treatment. All chamber systems performed well, and the thorough training of the operating crew stood us in good stead.

MS.

You forgot to
say status
patient is
improving!

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2. Saturn Program Technical Audit: Detail plans have been developed for the manufacturing technical audit team to review contractor Saturn V phased-down and restart capabilities. Contractor personnel have been selected to participate with the S&E-ME Audit Team. The Manufacturing Audit Team will consist of the following personnel:

Mr. James P. Orr - Welding Processes and Tools
Mr. W. Potter - Facilities and Tools
Mr. M. Sharpe - Chemical Processes and Composite Structures
Mr. E. R. van Orden - Electrical Processes
Mr. J. Williams - Mechanical Processes and Composite Structures
Mr. Patrick F. Keys - Program Management
Mr. Dave Norris - Safety Office

Between October 5 and November 23, 1969, they will visit IBM-Huntsville, McDonnell Douglas, North American, Rocketdyne, Michoud, and MTF. ✓

3. Space Tool Development: MSC has asked for a review of our development on Adhesive Bonding of Studs and consideration of using this on the first Workshop in M508 experiment where adhesives are required to provide attachment points at previously unprepared sites inside the spacecraft so that restraint systems may be used. The PI will visit this laboratory this week. ✓

NOTES 9/29/69 SPEER

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9/29/69

1. AAP Operations Interface with MSC: Lee James, Ludie Richard and others from MSFC met with key people at MSC and Bill Schneider for an all-day meeting to discuss the principal technical and management interfaces between the two Centers on AAP. Although we spent quite some time on a few detailed implementation questions, I believe the most important result of the meeting is a clear understanding what MSC wants and does not want us to do. I was impressed by the rigid hard-line attitude to do the total operations planning activity (in the broadest sense) exclusively at MSC and primarily with some 80 contractor personnel - to be located at MSC under supplemental contract. However, we achieved a reasonable understanding on the need for MSFC to validate the various inputs to operations planning and documents although the methods to be used differ from those proposed from our side. I believe, we can work this interface the way MSC wants but would consider their approach less than optimum. The meeting was a needed step and will be followed up by similar meetings in the future. ✓

2. L/V 2nd Burn Telemetry Coverage: At the Aircraft Operations Group (AOG) meeting at PAFB we were informed that the four aircraft (ARIA) currently scheduled to support future Apollo missions cannot provide the required 2nd burn coverage for all days, the azimuth range (72-96°), and both injection opportunities of Apollo 12. We are taking action to assure adequate coverage. ✓

3. Advanced Computer Study: The Mission Approach and Consolidation Group of the Advanced Computer Task Team met for the first time on 9/24 at MSC. Specific tasks were defined for each of the three Centers and work is being started now. Preliminary scheduling indicates that a final report and recommendation will be given to Dr. Turnock in February 1970. ✓

Dr. von Braun

NOTES 9/29/69 STAMY

9/29/29

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S-IC STAGE QUALITY: A meeting was held at MAF on September 24 with MTF Quality personnel to review progress on the joint survey of the quality activities associated with S-IC for each phase of processing from manufacturing through launch. (Reference Godfrey Notes 9/15/69, copy attached.) After further review of the data by all parties, a follow-up meeting is planned to reach final conclusions. ✓

COMPUTER OPERATIONS: Mr. Jim Shepherd, PM-DIR, visited Slidell September 25 for a briefing on computer operations and for discussion on alternatives available to us for overcoming some of the problems caused by 3-G system deficiencies. Several ways for attaining better communication and coordination with MSFC/Huntsville on computer operations were proposed, which should contribute to smoother operations. ✓

NOTES 9-29-69 Stuhlinger

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9/3/29

1. ASTRONOMY MISSION ON DRY WORKSHOP II: Dr. Mueller or his representative will give a presentation on his proposed stellar telescope system for DWS II to the Astronomy Missions Board on October 17. As of now, no detailed information on this system exists at OSSA or the AMB. ✓
2. VISITS TO LABORATORIES: As part of the AD-S functions, George Bucher and I are visiting the S&E Laboratories from time to time. There are several small, but capable nuclei of inhouse capabilities for science-oriented, but engineering-type, flight project-related activities existing in our laboratories which I believe should be encouraged and supported by MSFC management. If you agree, I would like to discuss possible approaches with you, H. Weidner, and others, perhaps in November. ✓

Please do B